ELECTRICAL TIMES

THURSDAY
14 FEB.
1952
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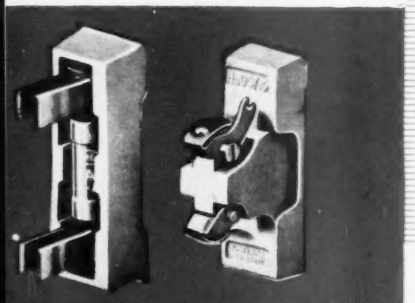
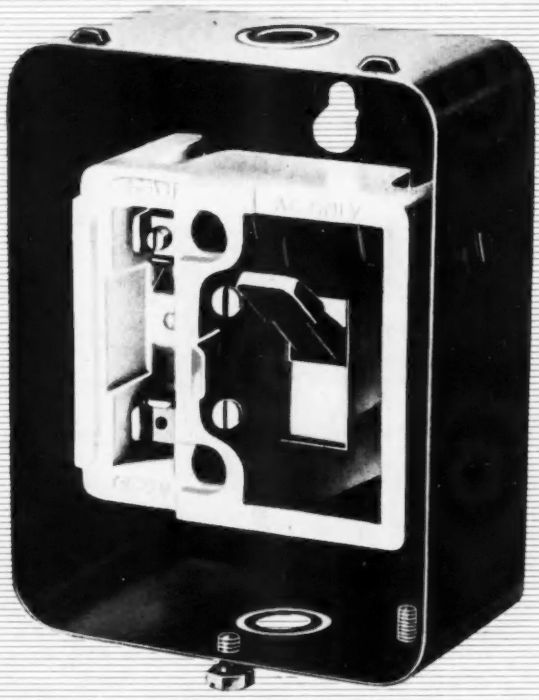
NEW

right through

FOR SINGLE POLE AND NEUTRAL DUTY



Choose between cartridge or rewirable fuses. The Carriers are interchangeable.



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are the steel-clad and all-insulated versions of an entirely new range of switch fuse gear designed by MEM for single pole and neutral installations. All the skill of MEM's design team has gone into this job. Outstanding features are extreme compactness and simplicity of wiring—slow break A.C. switch, choice of BS1361 cartridge or rewirable fuses with interchangeable carriers, and effective interlocking. Available in steel-clad and all-insulated units for 15, 30 and 60 amps including 2, 3 and 4 way splitters.

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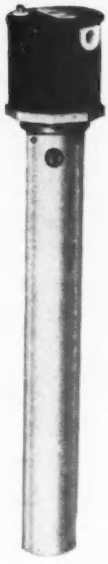

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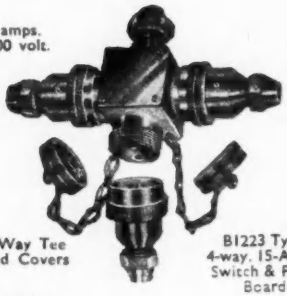
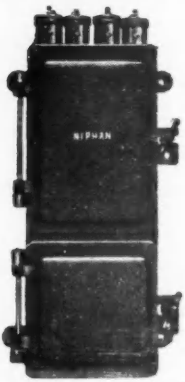


3-Way Tee and Covers

Flange Socket and Cover



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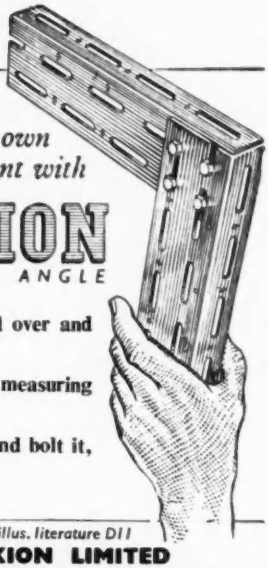

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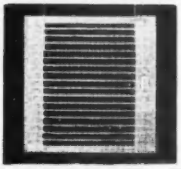

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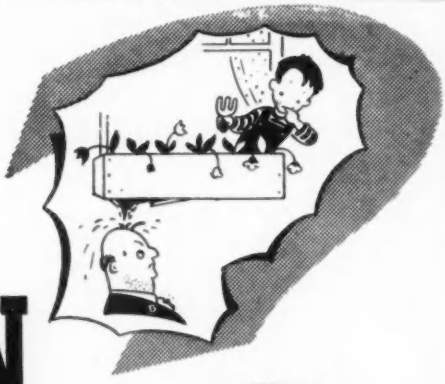

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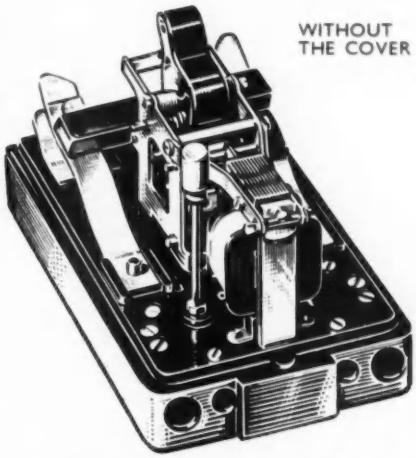

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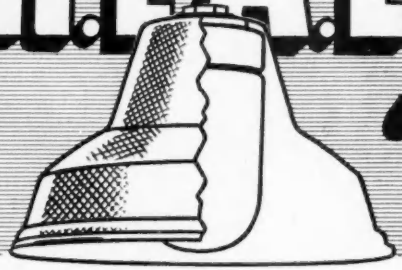

This R.E.A.L. Heavy Duty fitting is typically tough! Watertight and non-corrodible, the R.E.A.L. Patent one-piece porcelain body, and the screw-neck glass globe, are protected by the 'overall' formation of the reflector, while the entire weight of the unit is carried by the Aluminium Die-cast top-member.

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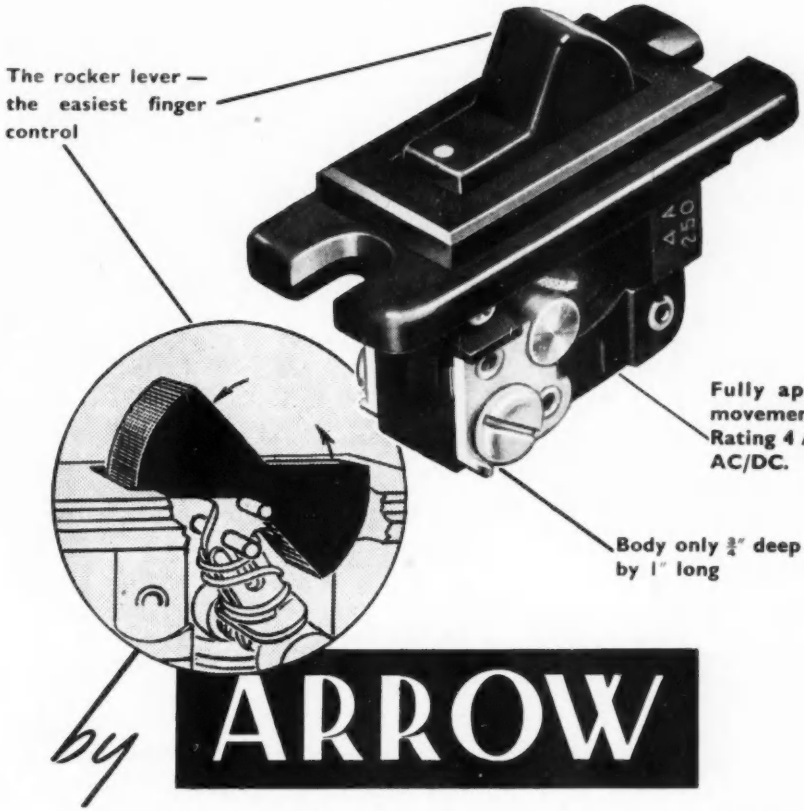

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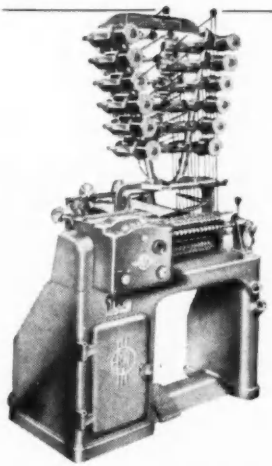
Weight 6¾ lbs. (including leads).



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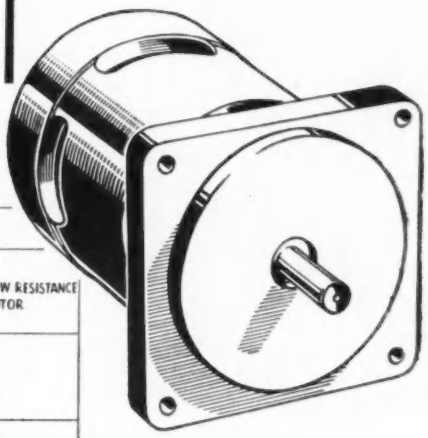
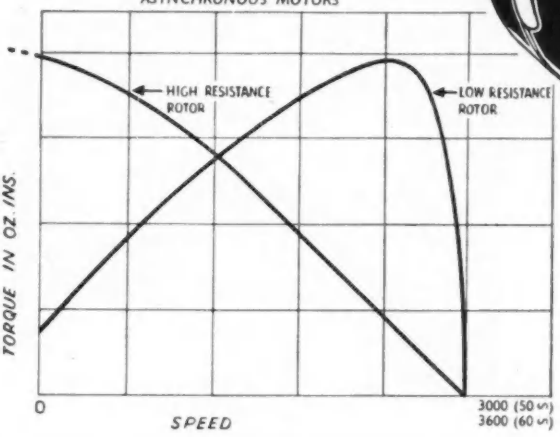


CHARACTERISTIC CURVES FOR ASYNCHRONOUS MOTORS



Frame size and symbol	Type	Voltage	Phase	Frequency C.P.S.	No load speed r.p.m.	Torque	
						Starting oz. in.	Running oz. in.
FC1/O	Asynchronous	230	1	50	2900	2·5	2
FC10/O	Synchronous	230	1	50	3000	0·75	0·75
FE16/C	Synchronous	230	1	50	3000	6	6
FE17/A	Asynchronous	50	3	50	3000	30	9
FE18/C	Asynchronous	230	1	50	2950	11·5	10

1) The motors may be supplied wound for 60 C.P.S. and other voltages.

2) The asynchronous motors can be supplied with high resistance rotors giving high starting torques.

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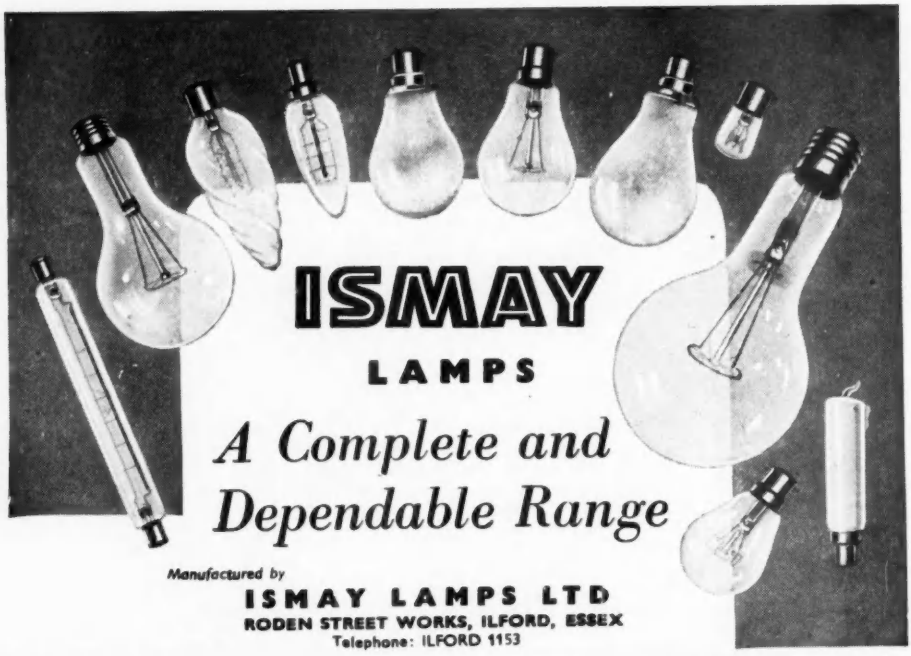
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Horstmann Electric Time Switches are renowned for their unfailing reliability. The comprehensive range covers hand wound models (15-, 21- and 40-day run), electrically wound and synchronous models with or without spring reserve as required.
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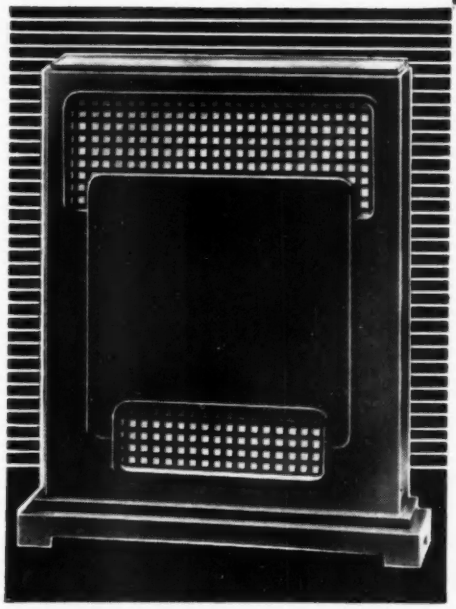

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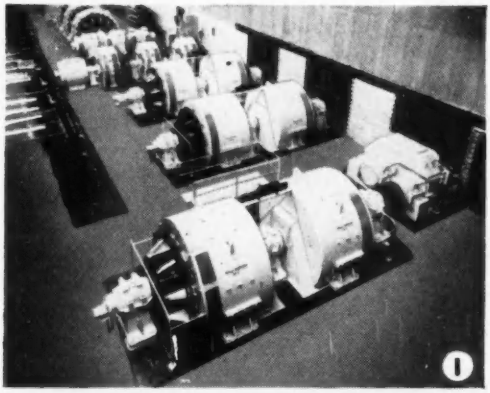
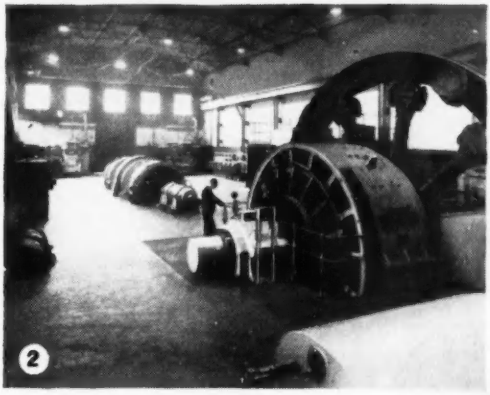
Rolling Mill Equipment

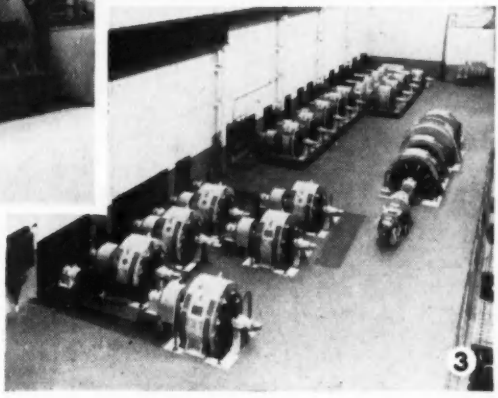


1 Three double-unit 2,600 horsepower D.C. motors with main and auxiliary motor generator sets driving a 66" 3-stand tandem cold strip mill at the Rogerstone Works of Northern Aluminium Co., Ltd.



2 2,200 horsepower D.C. motor and motor generator set driving a Pilger seamless tube mill at the Clydesdale Works of Stewarts & Lloyds Ltd.

3 D.C. motors (totalling 6,850 horsepower) and motor generator set driving a Morgan rod mill at the Cardiff Works of Guest, Keen and Nettlefolds (South Wales) Ltd.



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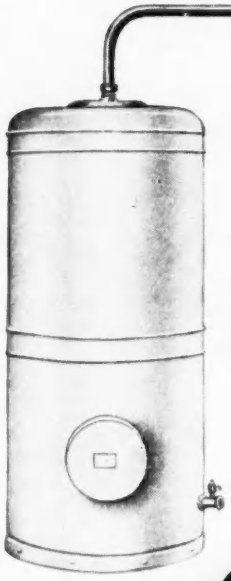

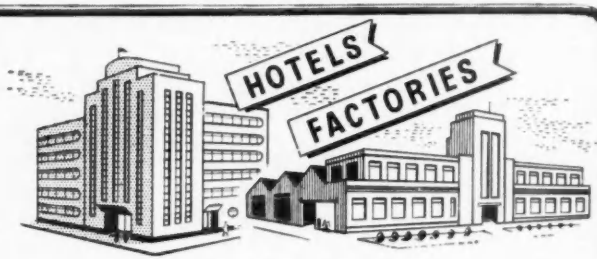

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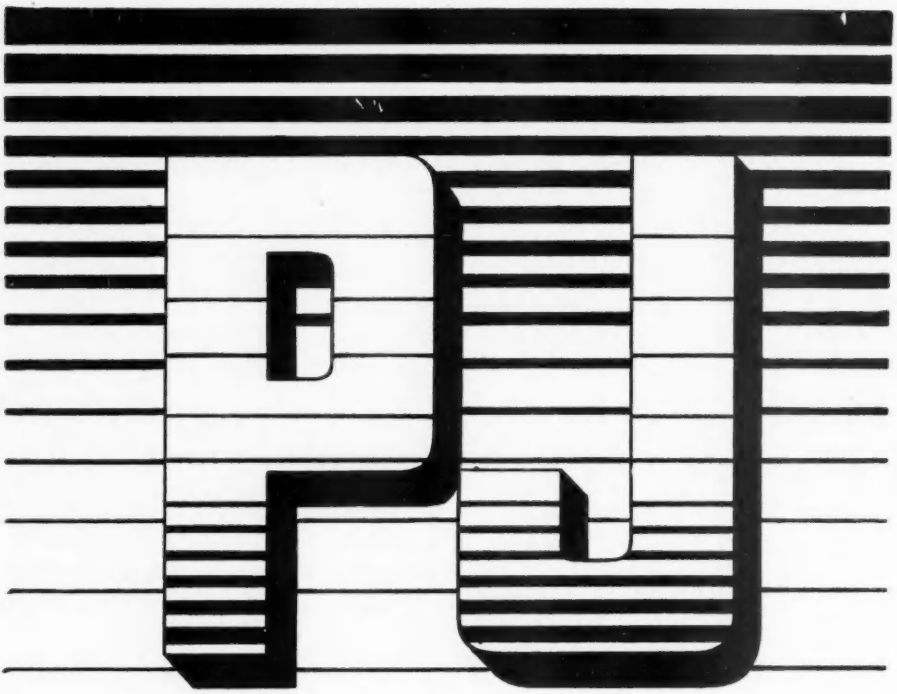

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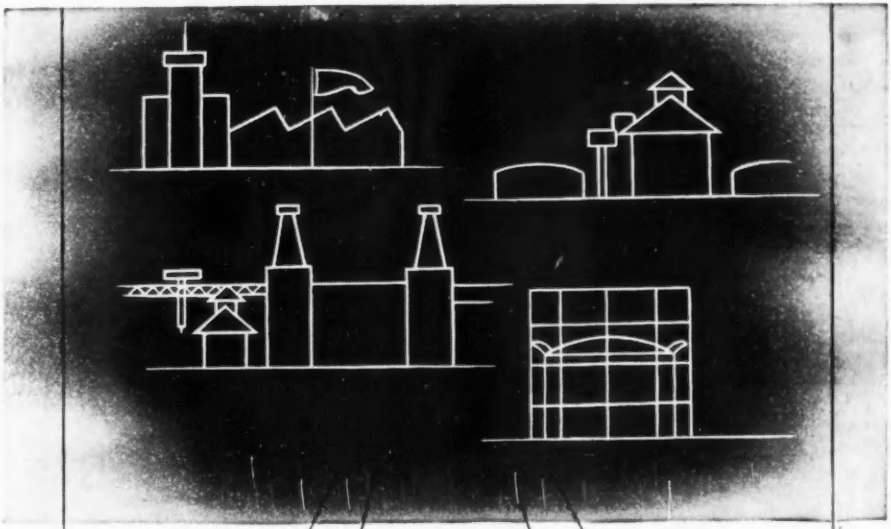

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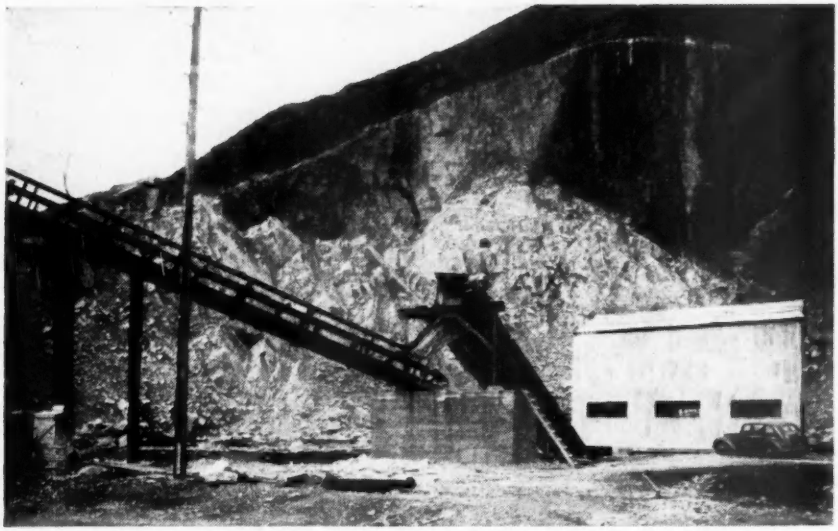
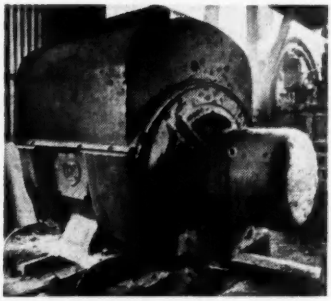
'ENGLISH ELECTRIC'

industrial motors





Electric Drives for Quarries

'ENGLISH ELECTRIC' have developed a range of electric motors suitable for the many mechanised jobs in the modern quarry.

These motors give maximum reliability in gritty and dusty atmosphere irrespective of whether they are operating drills, compressors, screens, crushers or conveyors.

The motor illustrated, left, is an 'ENGLISH ELECTRIC' totally enclosed, closed air circuit, 100 h.p. 725 r.p.m. slip ring motor driving, through vee belts, a 36 in. x 24 in. primary crusher in a Scottish quarry.

The ENGLISH ELECTRIC Company Limited

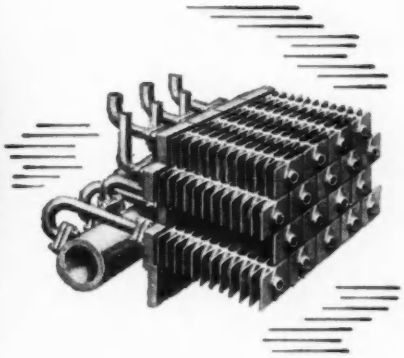
QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

Industrial Motor Works, Bradford

Works: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL

BM.1

Acclaimed by those who know . . . . Best



The world's most advanced Economiser design is the Green's Premier Diamond Type 12, with cast-iron gilled sleeves shrunk on steel tubes arranged compactly in shallow tiers.

The Type 12 construction means better accessibility, easier and thorough inspection, high heat transfer, minimum loss of draught, resistance to corrosion, joints with the patent pressure seal ring—simple and reliable, easily made and taken apart. Also available with welded joints.

This Economiser scores on every possible count.

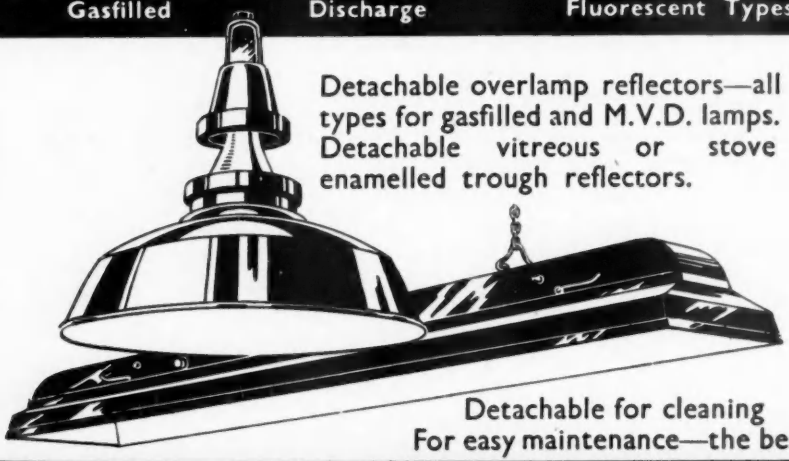
GREEN'S ECONOMISER

E. GREEN & SON LTD · WAKEFIELD

Makers of economisers for more than one hundred years

GE 106

THORLUX INDUSTRIAL LIGHTING EQUIPMENT. Manufacturers of Gasfilled Discharge Fluorescent Types



Detachable overlamp reflectors—all types for gasfilled and M.V.D. lamps. Detachable vitreous or stove enamelled trough reflectors.

Detachable for cleaning
For easy maintenance—the best.

F. W. THORPE LTD. WELBY RD HALL GREEN **BIRMINGHAM 28**

SPRINGFIELD 3318 GRAMS: THORLUX B'HAM

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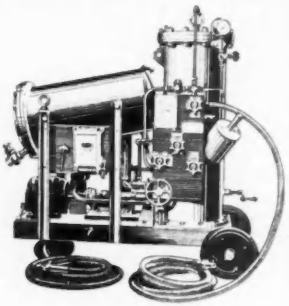
The insulating value of used transformer and switch oils by one passage through the Metafilter is raised to a higher break-down voltage than the new oil.
The plant is purely mechanical and extremely simple in operation.



Capacities from 20 *gallons to* 1,000 *gallons per hour.*

METAFILTRATION

PHONE: HOUNSLOW 1121/2/3
GRAMS: METAFILTER, HOUNSLOW

THE METAFILTRATION COMPANY LIMITED, BELGRAVE ROAD, HOUNSLOW, MIDDLESEX

BECAUSE of their great versatility, McKechnie brass and bronze extrusions and stampings are becoming ever more popular in the electrical industry. Their faultless finish and minute closeness to size reduces or entirely eliminates machining. Thus time, tools and labour are saved. Production is increased. Costs are lowered. We sell rather more tonnage when a bank has a new grille or when main line expresses are built, but we are just as proud of the big things we do in small compass.

McKechnie Metal Technique is ever at the service of Industry. For details please write to 14 *Berkeley Street, London, W.*1.

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Enquiries for Lithopone and Solder to: 14 Berkeley Street, London W.1.
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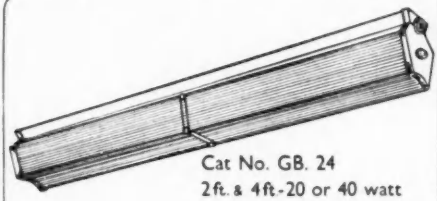
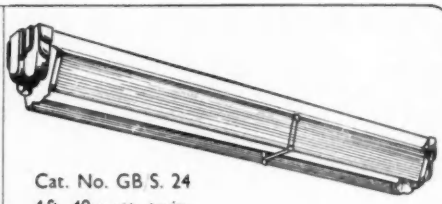
New Zealand Works: McKechnie Brothers (N.Z.) Ltd., Carrington Road, New Plymouth.

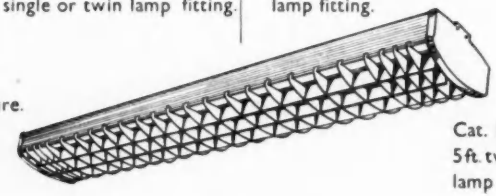


Cat No. GB. 24
2ft. & 4ft.-20 or 40 watt
single or twin lamp fitting.



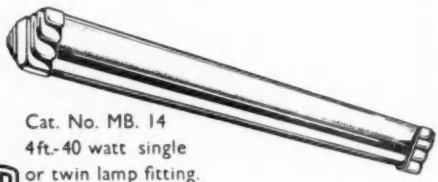
Cat. No. GB.S. 24
4ft.-40 watt twin
lamp fitting.

Please write for
illustrated Brochure.



Cat. No. LF. 25
5ft. twin 80 watt
lamp fitting.

Cat. No. VC. 22B
2ft. twin 20 watt
lamp fitting.



Cat. No. MB. 14
4ft.-40 watt single
or twin lamp fitting.

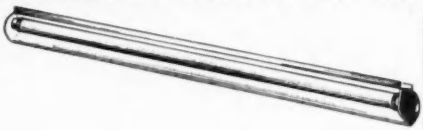
"Install Hi-Craft fittings and lamps and make Light of it!"

SB Hi-Craft FLUORESCENT LAMPS have a rated effective life of 5000 HOURS

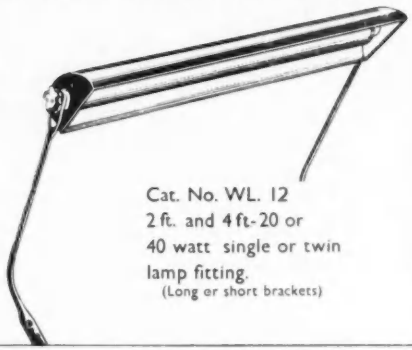
Hi-Craft Fittings

SMART & BROWN (ENGINEERS) LIMITED

TRADING ESTATE, SPENNYMOOR, CO. DURHAM



Cat. No. SR. 149
2ft. and 4ft.-20 or
40 watt lamp fitting.
(Remote control gear)



Cat. No. WL. 12
2ft. and 4ft.-20 or
40 watt single or twin
lamp fitting.
(Long or short brackets)

CHIEF ENGINEERS—

know that Lancashire Dynamo make the right motor for the job!

L.D.C. electric motors are built in a large number of standard sizes and types covering a wide range of outputs. When it's a question of special requirements L.D.C. supply motors of the correct enclosure for *every* industrial situation.

An L.D.C. 7 H.P. Vertical Drip-Proof Motor.

LANCASHIRE·CRYPTO

The Symbol of Power in Industry for over 50 years.

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5007	42/-
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T. M. C. - HARWELL (SALES) LTD.

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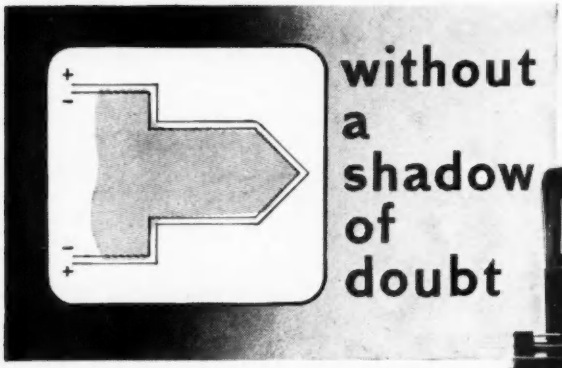
To counter the effect of track subsidence, special adjustable supports have been designed for the overhead equipment, enabling the contact wire to be maintained at the correct height above the track.

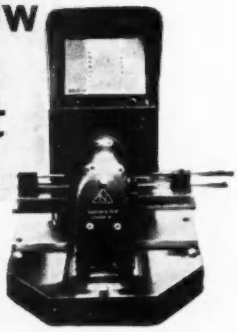
All the overhead equipment, the supporting structures and the foundations were designed, supplied and installed for British Railways by BICC and BIC Construction Company Ltd.

Electrification by B.I. Callender's

BRITISH INSULATED CALLENDER'S CABLES LIMITED
NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2



. . . optical inspection is the most efficient method of checking dimensions and tolerances of small machined parts, mouldings, stampings, pressings, etc.



THE NEWTON PROFILE PROJECTOR provides greater speed, requires a lesser degree of operating skill, and at the same time, completely eliminates the maintenance and replacement costs associated with mechanical gauges.

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Associated with Metropolitan-Vickers Electrical Co., Ltd. *A member of the A.E.I. group of companies*

The Kenwell Angle Ball Socket makes every shed roof job a "Piece of cake".

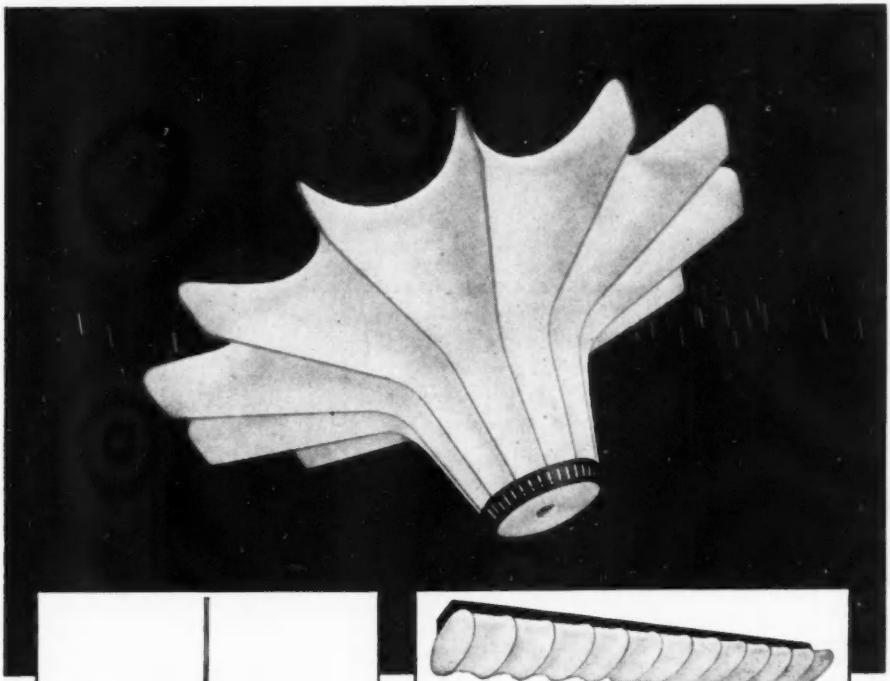
The Kenwell Standard Ball Socket has a self made reputation for being "just the job".

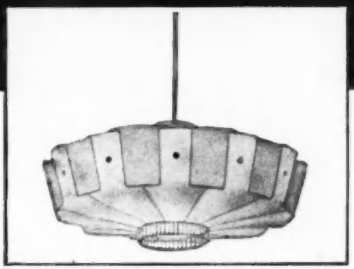
KENWELL

Small Pressure Die Castings (Bacup) Ltd.,
Lanehead Works, Bacup

ALL-INSULATED SWITCH FUSE
WITH 15 AMP. FUSE
LIST NO. N.101G.

Create A NEW SHAPE





To take 80 watt Osram fluorescent lamps

New methods and new materials are being used by the G.E.C. in the design of unusual and fascinating lighting fittings made from a medium called "Chrysaline" formed on to a wire frame. These lighting fittings can be made in many shapes, sizes, or colours. They are non-inflammable, easily cleaned, moistureproof, and give excellent diffusion and light transmission.
G.E.C. design and illumination engineers are eager to help you to take advantage of this new lighting medium.

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Lighting Fittings in Chrysaline

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

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N C S

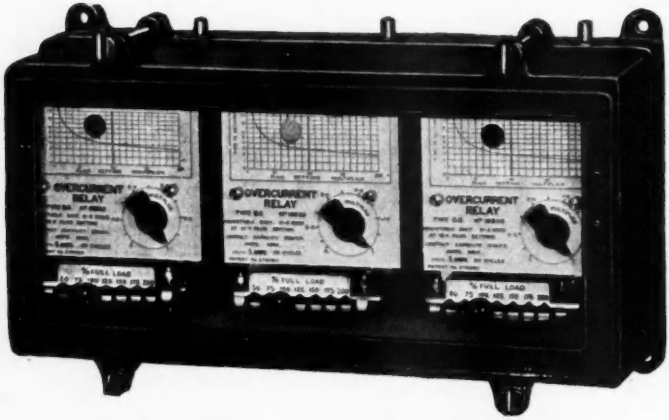
PROTECTIVE RELAYS

HIGH QUALITY

TO B·S 142/1942

ALWAYS UP TO DATE

Ensure unfailing performance. Generators, Transformers, Transmission Line Busbars, Feeders, Meters, etc., are fully protected by Nalder "L" type relays, as used in leading Power Stations throughout the world.



NALDERS RELAYS have high torque, low energy consumption, and a wide range of adjustable settings. They are vibration and surge proof, fitted with reliable contacts and operation indicators, and occupy small panel space.

VARIOUS TYPES are available in Nalders "L" Series, single, double and triple pole patterns, for horizontal or vertical mounting.

Conforming in all respects to the latest requirements of B.S.142/1942.

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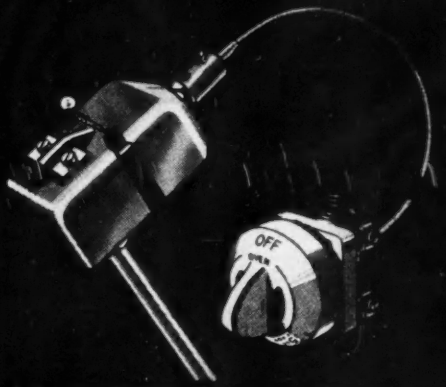
The oven thermostat

WITH FLEXIBLE DRIVE



Some just happen; this one was designed . . . . . designed to cut out the snags . . . . designed for minimum maintenance . . . . designed (note the flexible drive) for easy fitting . . . . designed — and made — by people who know.

SUNVIC

Domestic temperature controls

SUNVIC CONTROLS LTD., SUNVIC HOUSE, ESSEX STREET, STRAND, LONDON, W.C.2
Member of the A.E.I. Group of Companies

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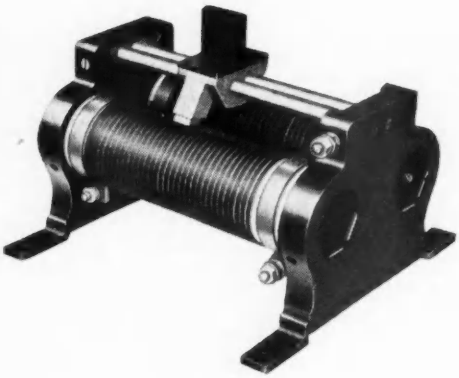
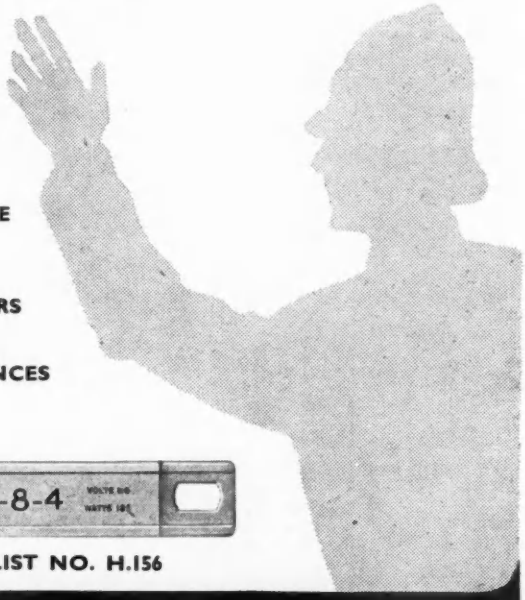
Registered Trade Mark



TUBULAR SLIDING RESISTANCES

Manufactured under Patent Nos. 561689 & 561690

SLATE WOUND SLIDING RESISTANCES
TUBULAR SLIDING RESISTANCES
STUD TYPE REGULATORS
DIMMERS—STUD OR SLIDING TYPES
ASBESTOS WOVEN RESISTANCE AND HEATING NETS
LOADING RESISTANCES
CARTRIDGE AND STRIP HEATERS
MICA WOUND RESISTANCES
PORCELAIN WOUND RESISTANCES



STRIP TYPE HEATERS · LIST NO. H.156

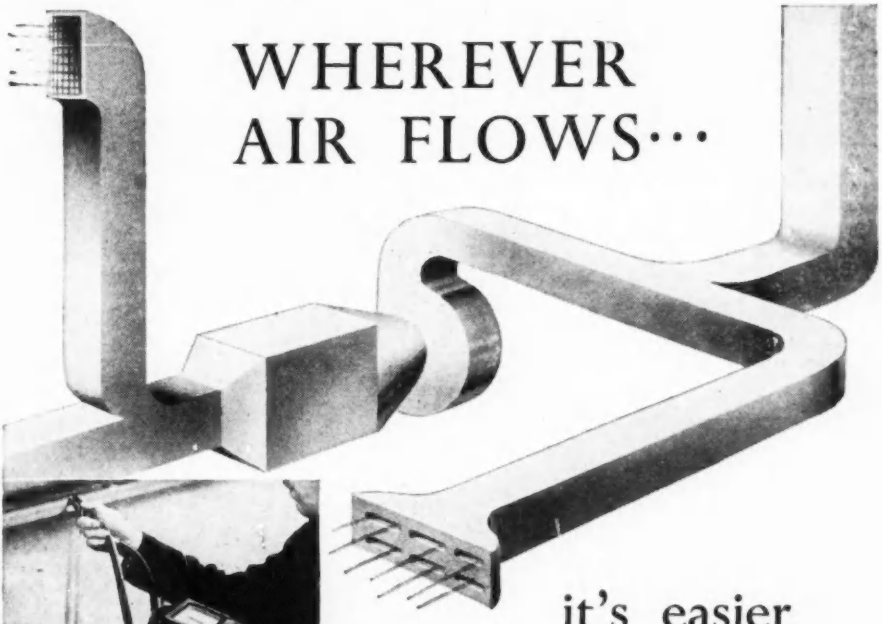
H. A. BIRCH & CO. LTD.

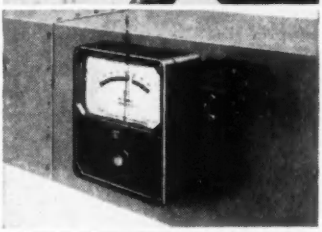
Wilohm Works, Wood Street, Willenhall, Staffs.

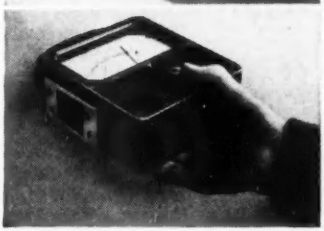
Telegrams: "Wilohm," Willenhall · *Telephone:* Willenhall 494-495

London Office: 33, Sudbury Court Road, Harrow · *Telephone:* ARNold 2694

WHEREVER AIR FLOWS···





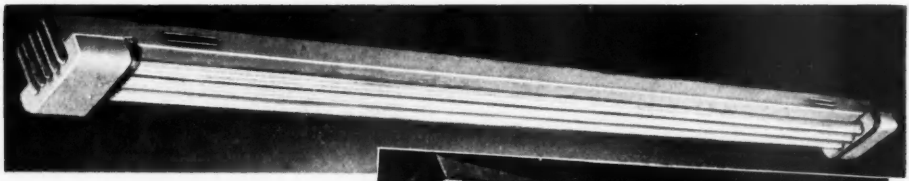


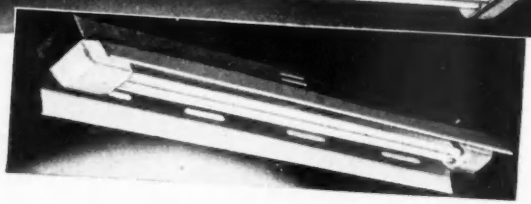
it's easier to measure with a METROVICK VELOMETER

There are few things easier than measuring air flow with a Metrovick Velometer. In open airways it is simply a question of holding the velometer in the airstream and reading off the air flow in feet per minute. Another design is available for dealing with closed ducts and inaccessible positions. The Metrovick Velometer is truly portable, weighing only 2 lbs, is economical in first cost and will save time and trouble in all industrial air flow measurement. Write for full technical details.

METROPOLITAN-VICKERS ELECTRICAL COMPANY LIMITED, TRAFFORD PARK, MANCHESTER, 17
Member of the A.E.I. group of companies

METROVICK *Velometers for air flow measurement*





Designed to new trends, Meico Cold Cathode represents a new development in the technique of lamp manufacture, combines the advantages of instant starting, greater efficiency, long lamp life and their ability to operate on reduced voltage supply.

A comprehensive range of Industrial, Commercial and Decorative fittings and combination of "U", Grid, Straight and Curved tubes. Illustrated and informative catalogues available on request.

MICRAMATIC LIMITED

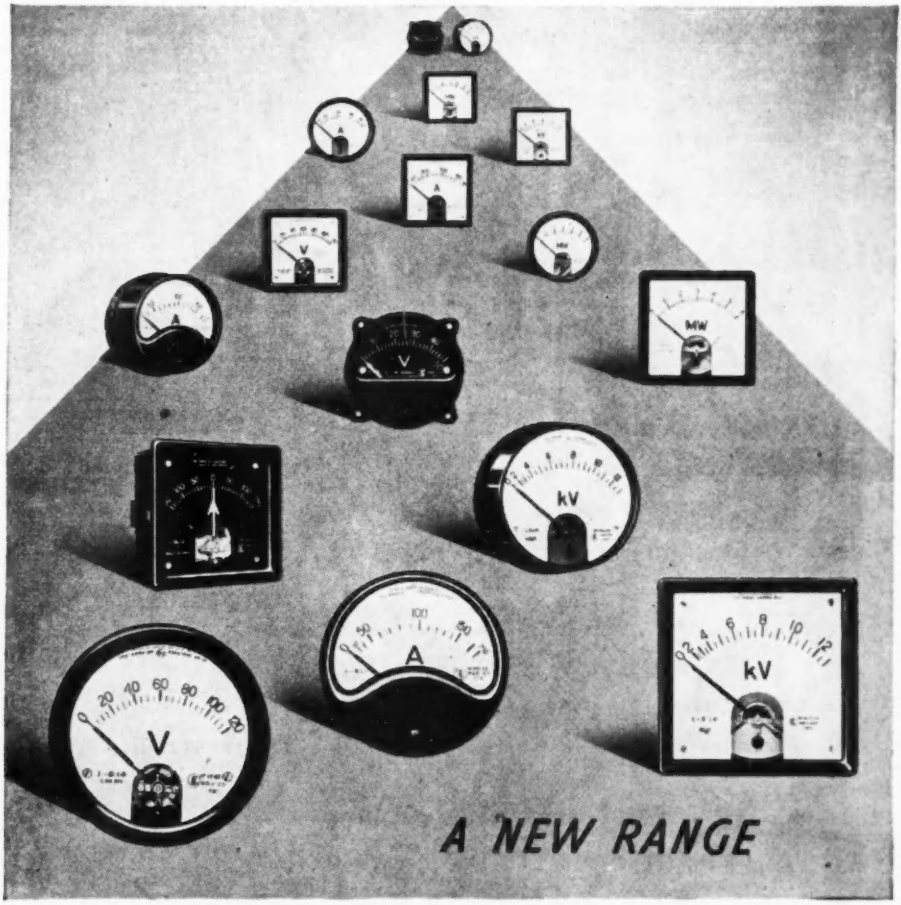
WOOTTON MOUNT
OLD CHRISTCHURCH ROAD
BOURNEMOUTH

MEICO Cold Cathode LIGHTING

WORKS · CONGLETON · CHESHIRE
BRANCHES AT LONDON · LEEDS · GLASGOW

'ENGLISH ELECTRIC'

indicating instruments



The ENGLISH ELECTRIC Company Limited

QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

Instrument Works, Stafford

Works: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL

IM.5

Preparing insulation rubber in the General Cables factory.

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During the last war when resources were strained to provide cables for the Forces, we were enabled to modify and improve our machinery. To-day General Cables plant is among the most modern in the country and operated by craftsmen trained in its use. The result, very naturally, is that General Cables products are second to none — in quality, consistency, and reliability.

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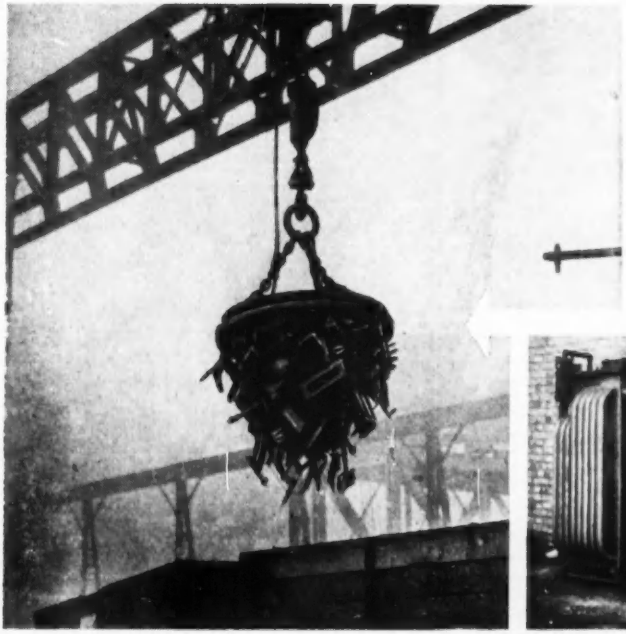
for ENERGISING MAGNETS



at the Yards
of
Messrs. Geo. Cohen
Sons & Co. Ltd.

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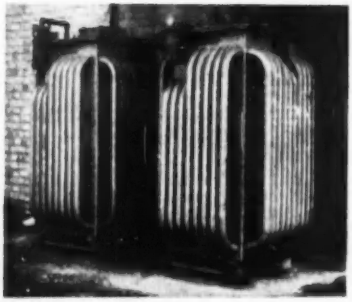

A number of large lifting magnets, operating in the open air at the yards of Messrs. Geo. Cohen, Sons & Co. Ltd., are receiving their power from two 25 kilowatt "Westalite" rectifiers. To be at a convenient point for connection to all magnets, the rectifiers have been installed out of doors, and it is necessary, therefore, that they be immersed in oil to protect them from the weather. This is but one of the many applications where arduous conditions exist (magnetic chucks and separators and vibrating screens are some of them), and for this reason we have designed ranges of both single- and three-phase oil-immersed sets to meet all requirements. For tables of output, sizes and more detailed information on these . . .

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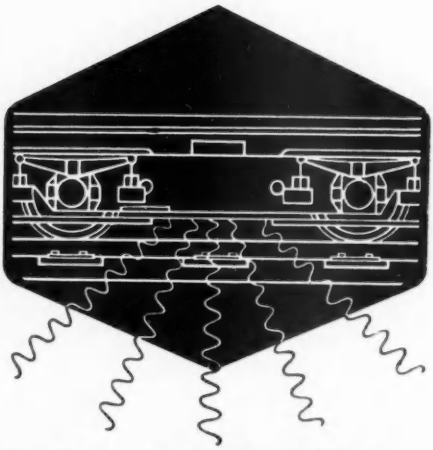

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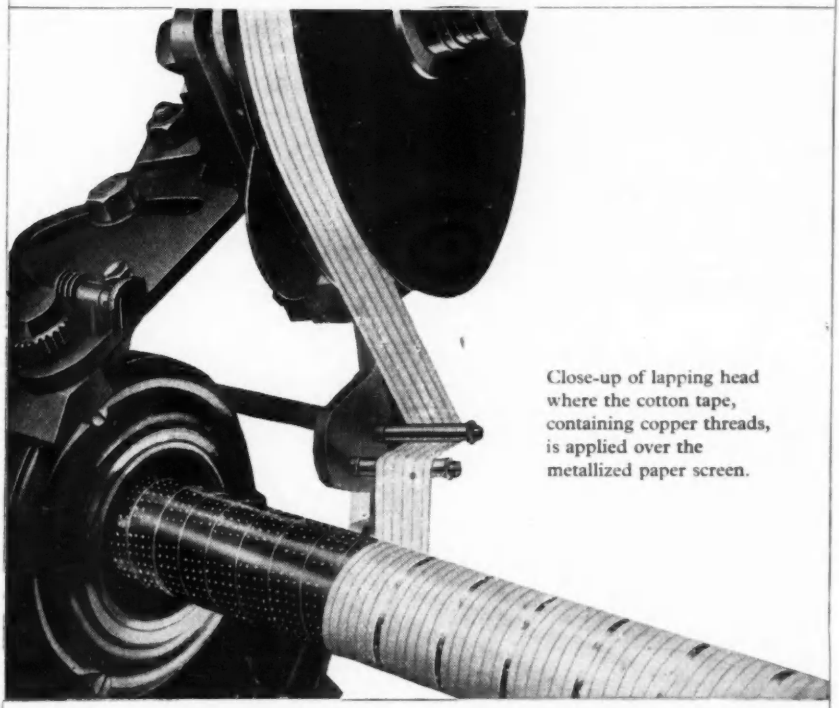

Close-up of lapping head where the cotton tape, containing copper threads, is applied over the metallized paper screen.

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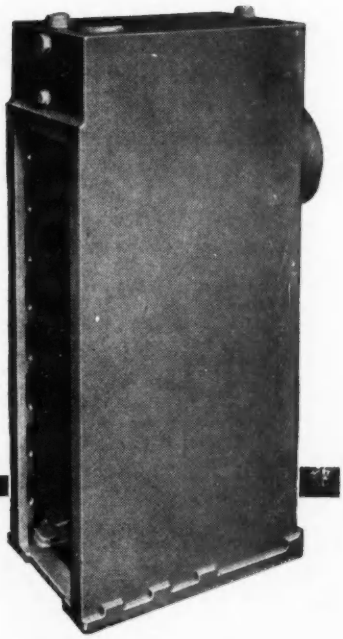

Heavy Duty Switchgear

Ferguson Pailin Heavy Duty Switchgear in which NOMAG castings are used

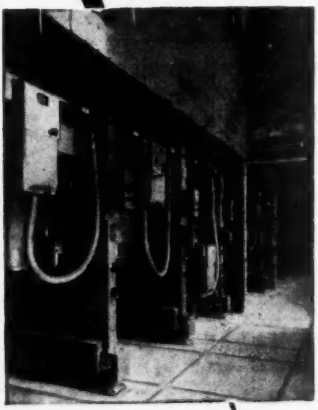

Photo by permission Scottish Electricity Board (South-Eastern Division)

To prevent overheating by hysteresis losses in covers, supports, etc., of heavy duty switchgear, leading manufacturers, among them Ferguson Pailin, Ltd., specify Ferranti NOMAG non-magnetic castings as a standard requirement.

This is but one of the many uses of this Ferranti discovery; designers in many other spheres have already realised how the unique properties of this non-magnetic austenitic type of cast-iron alloy can be turned to good account.

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High specific resistance..150 micro-ohms per Cm^2

Low resistance-temperature coefficient ·00045 per ^{0} C

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"It's a beautifully fitting job, Mr. Ash"

"But we are used to working to fine limits, Mr. Downs."

"*Indeed we are, Mr. Ash. That electrode holder we were asked to make is a good example of that. It was made in two unequal sections, parts of which were very thin; it had to be electrically insulating, and when the two parts were put together they had to make a push fit into a circular orifice, Mr. Ash.*"

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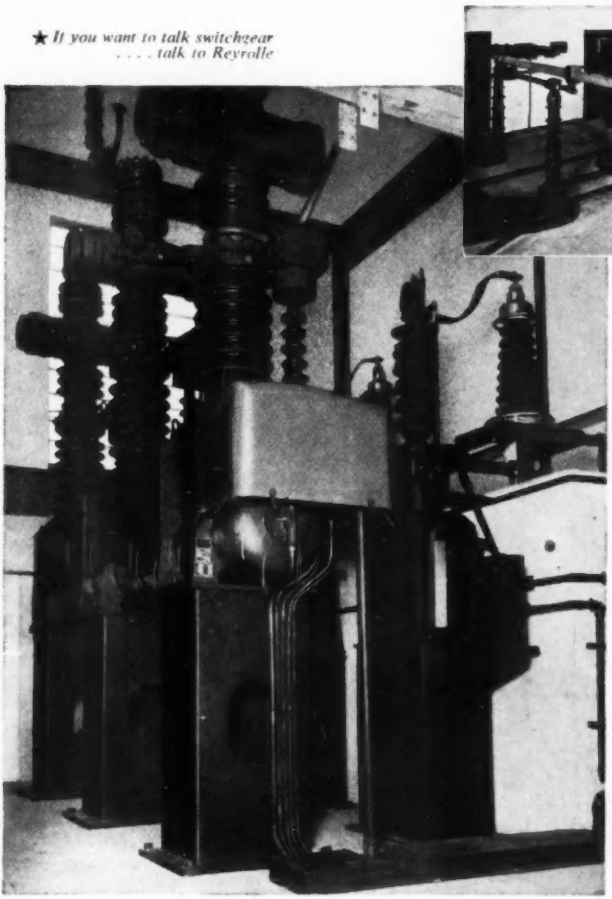

AIR-BLAST SWITCHGEAR AT NORTH TEES

The indoor installation of 66 kV air-blast switchgear at the North Tees Power Station of The British Electricity Authority (North Eastern Division) has circuit-breakers of 2500 MVA breaking capacity. There is a ring-busbar system in chambers above the circuit-breaker compartments. Each three-phase circuit-breaker, standing on a pedestal to give the necessary clearance, is mounted in a separate compartment, bushing-type isolators which are earthed in the open position are mounted in the compartment walls and allow safe access to equipment which has been isolated.

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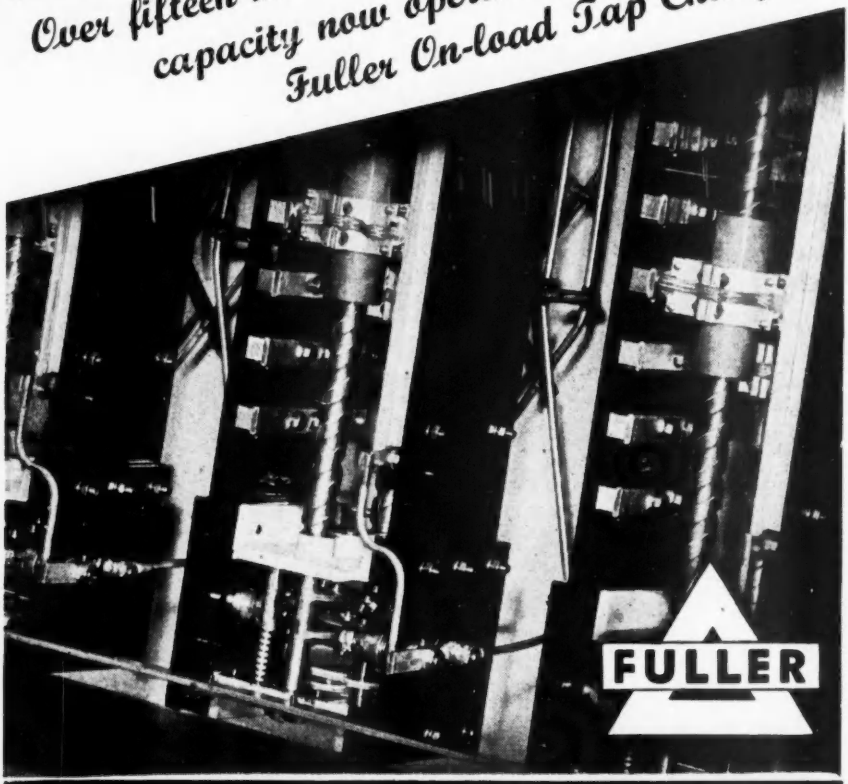

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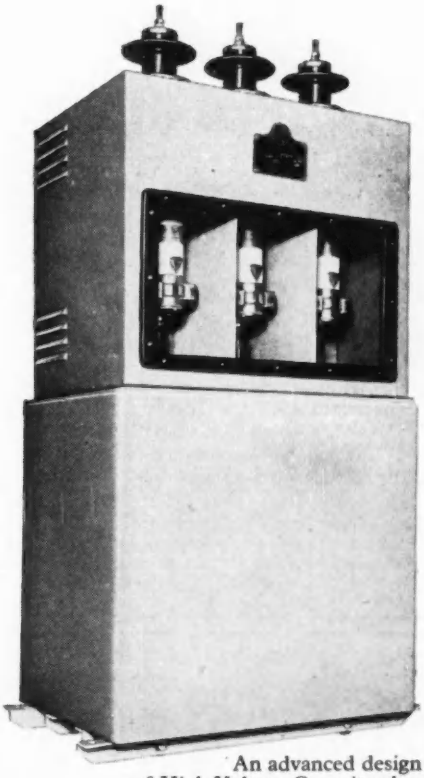

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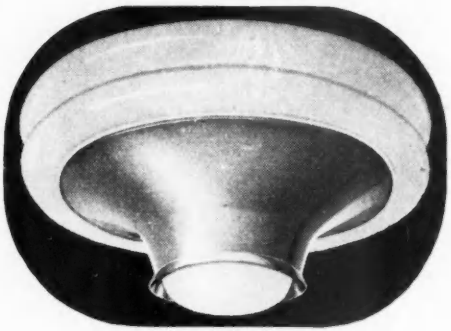

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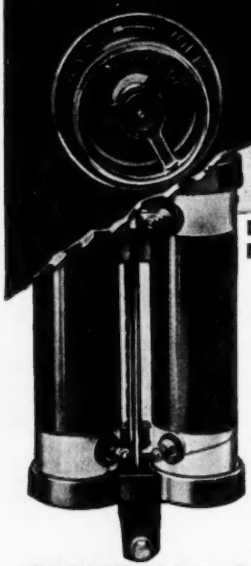

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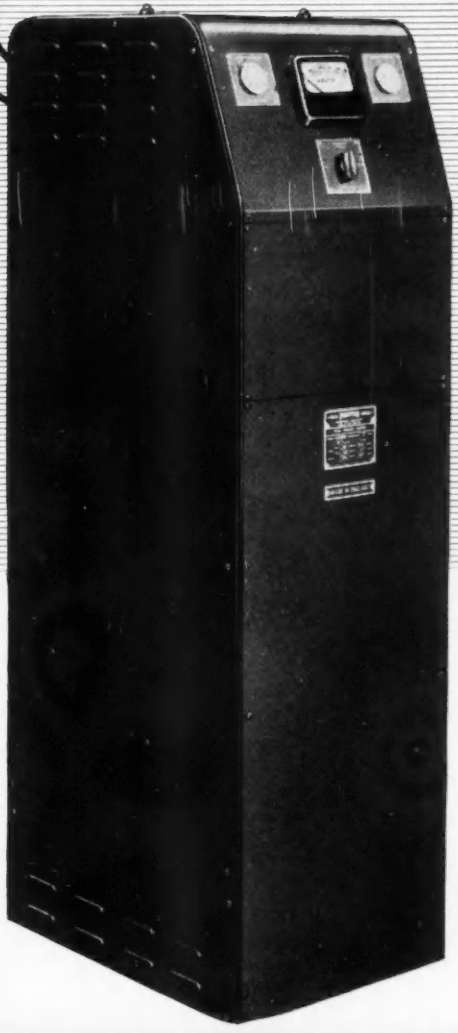

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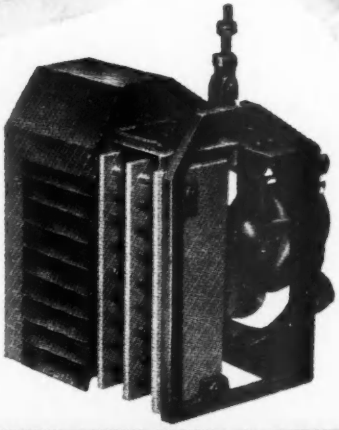

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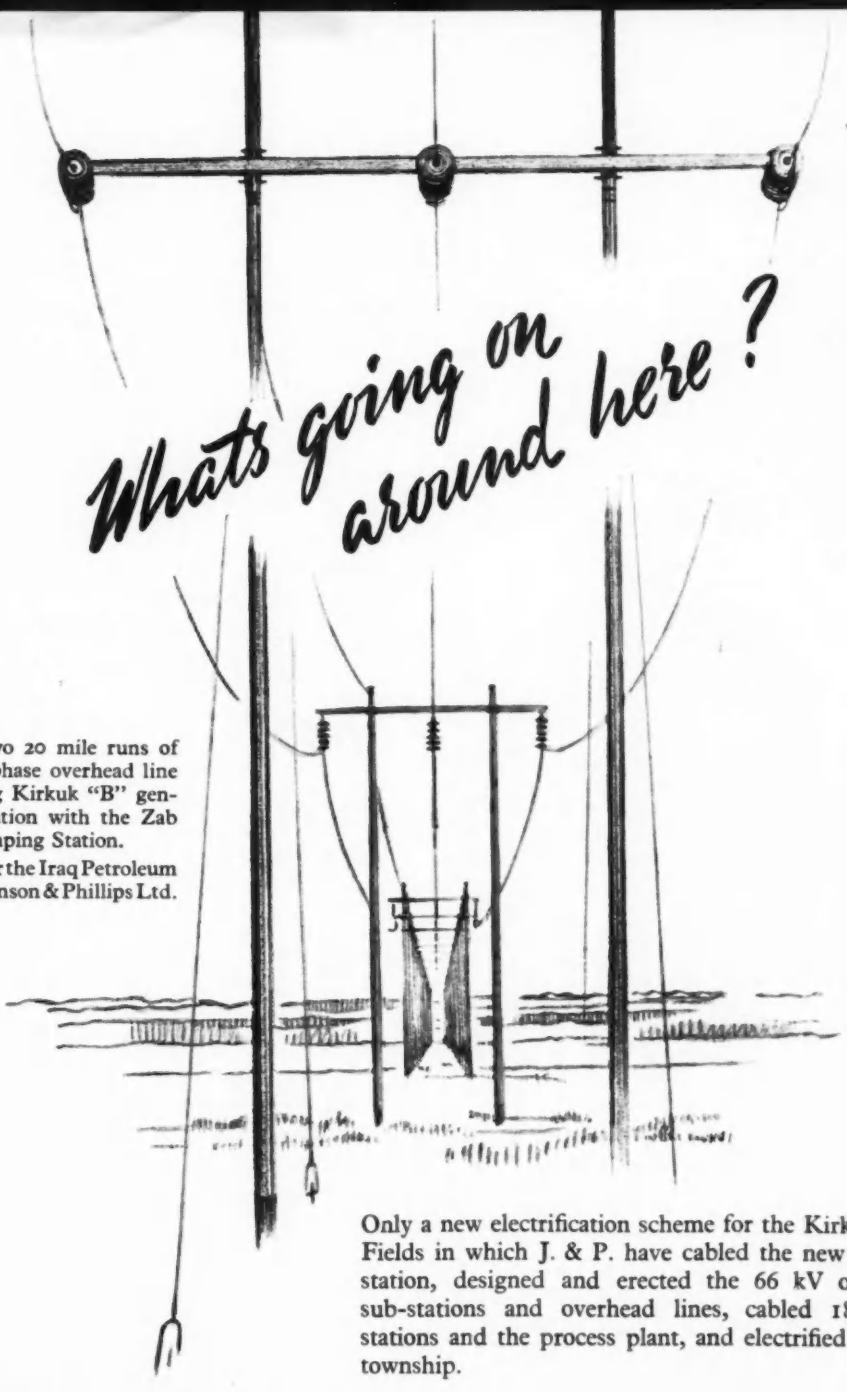

One of two 20 mile runs of 66 kV 3 phase overhead line connecting Kirkuk "B" generating station with the Zab River Pumping Station.

Erected for the Iraq Petroleum Co. by Johnson & Phillips Ltd.

Only a new electrification scheme for the Kirkuk Oil Fields in which J. & P. have cabled the new power station, designed and erected the 66 kV outdoor sub-stations and overhead lines, cabled 18 sub-stations and the process plant, and electrified a new township.

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ELECTRICAL TIMES

Vol. 121 No. 3145 THURSDAY, 14 FEBRUARY 1952

PUBLISHED EVERY THURS

SIXTY-FIRST YEAR OF PUBLICATION

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KING GEORGE VI

At this time of sorrow, we, in our humble sphere, pay our individual tribute to swell the nation's voice of respect and of regret at the passing of our great and democratic King. His reign has been no easy one. At the outset, his accession carried with it the aftermath of the constitutional crisis. Three years later the country faced a war of unprecedented scientific development in the weapons of defence and destruction, and in the uneasy years of peace which followed far-reaching changes were made in the constitution of the Empire. Through all these difficulties, with courage in the face of personal handicaps, with simple dignity and devotion to duty, he showed all the attributes that his people look for in a democratic monarch.

His Late Majesty had many associations with the electrical industry. He was a Patron of the Institution of Electrical Engineers and of the Electrical Industries Benevolent Association. The first memory we ourselves have of him dates back to 1929, when, as the Duke of York, he officially opened the first Hams Hall power station. His last public appearance on an electrical occasion was the opening of the Kingston station in 1948, when the shadow of ill-health was already upon him. It is fitting, therefore, that during the past week the many sections of our industry have sent messages to the Royal Family expressing sympathy at the nation's bereavement. And with those messages there goes out from all of us a vow of loyalty to Our Gracious Queen Elizabeth.

Editorial

FINANCING RESEARCH

FOR all its exciting story of advances in scientific knowledge and technical achievement, this year's annual report of the Electrical Research Association has as its leading subject the too-familiar theme of finance. Unlike much recent entreaty, however, the dual appeal that is made for increased funds is a sign of hope for the future rather than careworn anxiety for the present. An increase in members' subscriptions is asked for because the new basis of Government support for the Association has an increased incentive content, but the minimum grant is harder to obtain. But above this, and of greater immediate impact, is the appeal for funds for the Leatherhead building project. All who have visited the Perivale laboratories have been impressed by the cramped conditions in which much of the research work of the Association is carried out, and will appreciate the near-impossibility of further expansion on the present site. Co-operative research in the electrical industry has been so marked a success that it is deserving of the greater freedom that more spacious accommodation can give. Even in these difficult times there can be little hesitation in endorsing both branches of the E.R.A. Council's appeal, and in urging a Government which has stressed the importance of technological excellence, to give permission and facilities for an early start to be made on the building work involved.

D.C. IN THE FIELD

PLANS for the transfer of investigations of high voltage d.c. transmission from laboratory bench to the field were foreshadowed in last year's E.R.A. report. News that the widely representative committee responsible for this work has unanimously recommended this step provides the most important item of engineering interest in this year's report. Manpower and finance are recognised as two limiting factors, but it is advocated that, as far as these permit, work should begin at an early date on the building of full-scale terminal equipment, and that facilities for high-power transmission should also be provided. There can be no doubt that such a scheme involves heavy capital investment, or that its implementation would to some extent interfere with the work of extending and reinforcing the present British a.c. transmission system. Nevertheless, there are potential gains of the first magnitude to weigh against such immediate disadvantages. From the home aspect, some of the more grandiose schemes for long-distance transmission and for links with other countries depend for fulfilment on the availability of the technical features which d.c. can offer. Those same characteristics can be even more valuable in the wider spaces overseas, where centralised power can provide a basis for the industrial development of whole countries, and if British engineers and manufacturers have the necessary experience, a valuable market should open up.

HEAT OFF THE PEAK

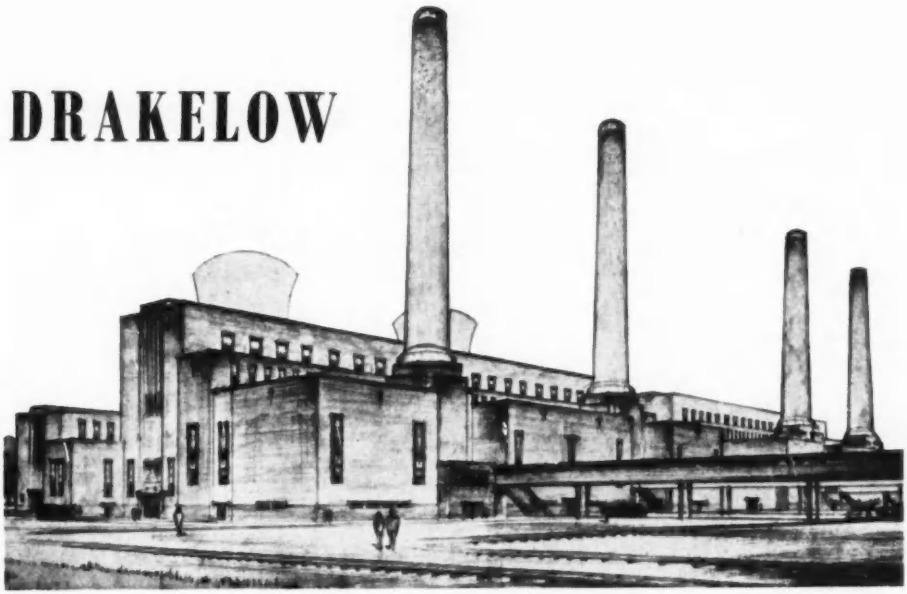
IN the two articles on electrical storage heaters which are published in this issue, the ELECTRICAL TIMES moves into a new sector of the electric heating discussion. In recent weeks attention has been focused on combating the general assault on portable electric fires, since these are under the strongest attack, but it has been kept in mind that condemnation of any one form of electric heating tends to disparage all. The virtues of storage heaters should be apparent to all. Pre-eminently, they are a benefit to the supply system, since the load they offer is a valuable contribution to the trough of the load curve, and adds nothing to the peak. If fuel economy is to be the touchstone, then just as strong a case can be made out. Operated away from peak hours, they are fed by the base load stations and can be credited with the highest range of thermal efficiencies, this, as always, being weighted by the consumption of very inferior coal. How widespread their application can conveniently be is largely a matter of capital cost and electricity board tariff policy; the specially favourable treatment they merit is not as widely accorded them as might be hoped. But the amateur fuel efficiency expert should be made to remember that there is little of offence in them to which he can point.

RURAL PROGRESS

SCOTS and Welshmen in the House of Commons made good use of two opportunities to debate rural electricity which arose in the week of normal business possible before the King's death brought proceedings to a tragic halt. The occasions were a North of Scotland Hydro Board borrowing Bill, and a general debate on Welsh affairs, and although in neither case were any notable new ideas forthcoming, the continued demand for electricity supplies was strongly stressed, and objections to requirements of guaranteed consumption and of service connection charges reaffirmed. In Wales, particularly with regard to the southern counties, the former complaint was the more strongly felt, while for Scotland it was the connection charges that attracted the greater attention. Both sets of Members of Parliament will be awaiting with interest and anxiety the promised review by the Minister of Fuel and Power of the whole range of rural electrification problems. In his only relevant answer so far he has been largely non-committal, pledging only capital expenditure permission for continuing schemes already started and for getting under way the more urgent among other planned extensions.

Meteor

DRAKELOW



Rapid progress noted in construction of first B.E.A. designed plant

DRAKELOW Power Station located near Burton, is noteworthy as being the first project being engineered, after nationalisation, by the B.E.A. The Generation Construction Department of the Midlands Division is undertaking this work. The station will be in two sections, "A" and "B," the section now under construction being designed to accommodate four 60 MW turbo-alternators and four steam generators, working on the unit system of one turbine/one boiler without interconnection.

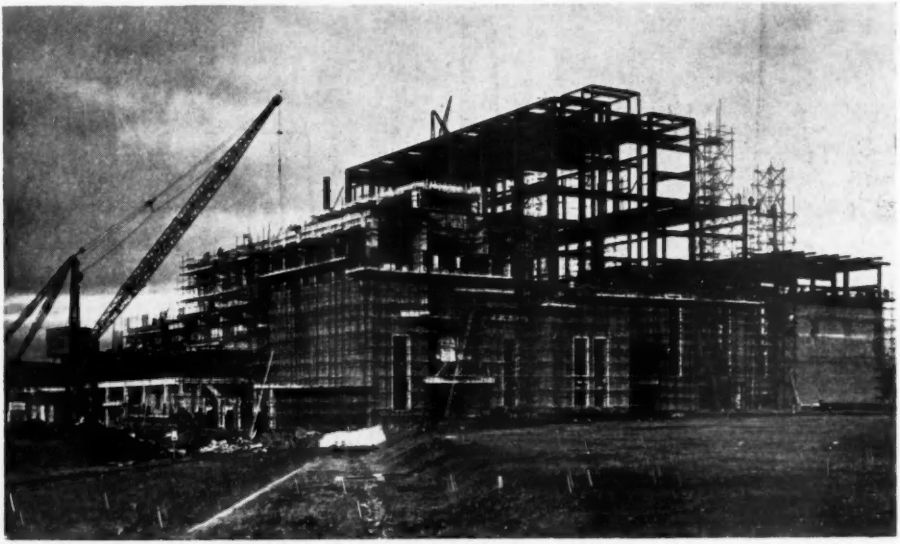
Site

The site is particularly well suited for power station construction, having a nearby railway system, and being located near the River Trent. A subsoil of gravel and marl, not only provides a good support for the foundations but also gives the necessary material for the manufacture of the concrete. The first contract for the site clearance was placed with Sir Robert McAlpine and Sons on May 23, 1950, and early in June special mobile excavating plant was brought on site and work began. After the preliminary survey, it was decided to excavate the whole site to a depth of about 6 ft., the spoil being used to provide the embankments required for the railways sidings. This excavation work also gave a mean level suitable for "A" and "B" stations and reduced the depth of the main foundations.

Progress has been remarkable in view of the supply position. At the moment, the circulating water tunnels have been completed, the turbine room, which is of ferro-concrete construction, has been erected, and two of the turbo-alternator foundation blocks are finished, the other two being in an advanced stage. Most of the boiler house structural steelwork has been erected and the brickwork is in process of construction. The concrete supports for the 132 kV switching station have been erected and the ground is being prepared for the erection of the cooling towers.

Plant Design

As mentioned before, the station is designed for four English Electric 60 MW turbo-alternators operating with steam conditions of 1,500 lb/sq in, 1,050° F. The turbines are three-cylinder machines with double-flow low pressure cylinders exhausting into twin condensers. Hydrogen cooling has been adopted for the alternators, which have built-in coolers, the hydrogen being circulated by axial flow fans, one at each end of the rotor.



Southern and eastern elevation of the generating station, showing turbine house on the left, the boiler house, centre, and the precipitators on the extreme right

There is no direct driven house alternator or exciter, the auxiliary supplies for each unit being obtained from a 6 MVA 11·8/3·3 kV transformer directly coupled to the alternator terminals.

The exciter is separately driven by means of a 400 h.p. 3·3 kV squirrel cage motor, and a stand-by exciter is provided for the complete station. To reduce instantaneous fault currents the alternator windings are earthed through a 40 ohm liquid resistance.

In confirmation with present-day practice, generator transformers are provided, rated at 72 MVA, 11·8/132 kV. These are delta-connected primary and star-connected on the 132 kV side at which voltage the machines are synchronised and switched. Station transformers, rated at 10 MVA 132/3·3 are provided for general station supplies. All the transformers are of the outdoor type fitted with conservators and naturally cooled, with the exception of the generator transformers which are provided with separate coolers with oil pumps and cooling fans.

Switchgear

The 132 kV outdoor switching station comprises 15 bays, initially laid out for the accommodation of circuits for two generators, two station transformers, four feeders and one busbar coupler. Air-blast switchgear with a rupturing capacity of 3,500 MVA remotely controlled from the generating station main control room are to be installed.

For internal supplies, single busbar, truck-type air-break units are specified, having a rating of 150 MVA at 3·3 kV and 25 MVA at 415 volts. Each generating unit has unit turbine and boiler 3·3 kV and 415 V switchboards to which are connected all the unit auxiliaries. Standby and starting supplies are provided from the 3·3 kV and 415 V station auxiliary boards, there being one station board for each pair of turbo-alternators and boilers. A diagram type control panel is provided in the main control room for the control of supplies to the unit and station 3·3 kV boards. The 3·3 kV system is resistance earthed, and the 415 V system solidly earthed.

D.C. supplies are provided by two 800 ampere-hour lead-acid batteries each of 115 cells, charging supplies being supplied by two 20 kW mercury-arc rectifiers. Emergency charging of the batteries can, however, be arranged from the standby motor-driven exciter provided for the main sets.

Power Station Layout

As can be seen from the accompanying photographs of the building of the power station, the layout is fairly straightforward. The turbine house is on the extreme left, and

outside it, past the two cooling towers, is the 132 kV switching station. Alongside the turbine house, and with its own crane, is the feed heater bay containing the feed pumps and the four h.p. heaters. Next is the boiler house, with the steam generation units and their associated pulverisers and exhausters, and behind them at basement level are the forced draught fans and motors. A switch house is located between the boilers and the precipitator bay, which contains, also at basement level, the induced draught fans. Possibly the only unusual feature is the inclusion of the precipitators within the building structure.

Boiler Plant

The four boilers, by International Combustion, Ltd., are each designed to evaporate 515 klb/hr at a pressure of 1,550 lb/sq in and at a temperature of 1,060° F. The design has been based on the use of low grade Midland fuel, having a gross calorific value as received of 8,770 B.T.U.s/lb, with 21·5% ash and 14% total moisture. The ash fusion temperature, 2,075° F, is low, and this, allied to the high steam temperature, has necessitated careful consideration of the design to achieve the specified operating conditions of continuous working for periods of up to 14 months with only on-load cleaning. The plant must also be suitable for two-shift operation.

The boilers are of Lopulco three-drum radiant design arranged for corner firing. Completely water-cooled combustion chambers are used. Gases leave the furnace through a specially designed exit channel which screens the high temperature section of the superheater from direct radiation from the combustion zone. To attain the high final steam temperature no water-cooled screen is provided between the front and rear walls before the superheater. The whole boiler and superheater unit is suspended from a rectangular structure and is thus completely free to expand in a downward direction. Feed at 430° F passes through twin Heenan all-welded type economisers. Control of the final steam temperature is automatically maintained within ±10° F by altering the vertical tilt of the burners. This tilting is carried out pneumatically, the control being exercised by a Kent steam temperature recorder.

Pulverising

Four Lopulco type L.M.16 mills are used per boiler, each driven by a 185 h.p. motor and swept by a Keith Blackman exhauster. Each mill delivers to one burner nozzle in each corner of the furnace. Two Wallsend Slipway pressure type oil burners are fitted in each corner burner casing, the total capacity being sufficient to steam the unit up to 80 klb/hr on oil alone. When firing on coal of the specified quality, three mills are sufficient for maximum continuous load, the fourth being available as an emergency standby unit.

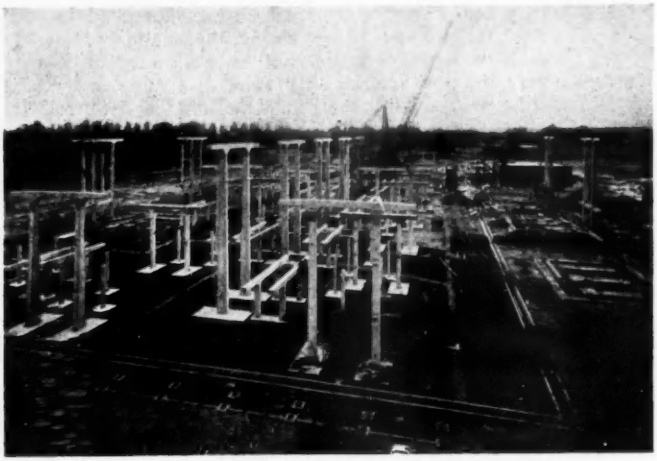
Two forced draught fans of Davidson's manufacture deliver air to the preheaters, from which a portion is taken to the mills for drying the fuel and conveying it to the burners. The i.d. and f.d. fans, coal feeders and mill classifiers are driven by variable speed commutator motors of Laurence Scott and Electromotors manufacture, and the furnace draught is automatically maintained constant.

Coal Handling

Coal is brought to the site by rail, and sidings have been constructed in the form of a triangle with "Empties" and "Fulls" sidings. The layout is such that the British Railways locomotives can draw a coal train right into the "Fulls" sidings, reverse, and pick up the empties. Each track can accommodate a train of 60 waggons and ultimately 12 tracks will be provided to both sidings which will enable 6,000 tons of coal to be handled per day. Seven miles of track have already been laid.

Four waggon tipplers are provided to the complete "A" station with bucket elevators, horizo ntal belt conveyors and inclined belt

This photograph of the turbine room shows the roof construction and the foundation blocks



General view of 132 kV switching station now under construction

The 275 kV switching station, which will be associated with the "B" section of the station, will be built on a similar site in the middle distance

conveyors delivering coal to the bunkers. large coal storage area is also provided.

Ash handling is by gravity sluices to an ash pump house, in which are located three 3,300 g.p.m. vertical spindle pumps. These elevate the slurry to a gantry and it is then carried by troughs to the ash disposal area on the low ground in a loop of the river.

Water Supply

The circulating water for the condensers has been designed so that any unit can use river water direct or run on the cooling towers. A river water pump house has been constructed up-stream to deliver water to the ponds and associated culverts near the station. When the river is running full it may be possible to extract 8 million gallons per hour, but in normal dry weather the river is slow and sluggish and the extracted quantity must be much reduced.

Only one cooling tower is being constructed for the first section of the station.

Water from the Trent is, however, unsuitable for boiler feed make-up, and two artesian wells of 15 in. bore are to be sunk through the sandstone and bunter beds to an anticipated depth of 600-700 ft. It is expected that a yield of 280,000 to 320,000 gallons per day will be obtained. From the wells, the water will be pumped to a water softening plant, associated with which are two reservoirs of about 1½ million gallons. After treatment the water will be pumped to the treated water tanks situated in the station itself.

Our thanks are due to the B.E.A. Midlands Division, and to Mr. F. W. Lawton (Divisional Controller) for inviting us to visit the site and for the information given above.

LIST OF MAIN CONTRACTORS

Main Railway Sidings and Preliminary Works: Sir Robert McAlpine and Sons (Midlands) Ltd.

Civil Engineering and Building Work: Sir Robert McAlpine and Sons (Midlands) Ltd.

Steelwork Superstructure: John Lysaght (Bristol Works) Ltd.

Brick Chimneys: P. C. Richardson and Co. (Middlesbro) Ltd.

Cooling Towers: Mitchell Construction Company.

Steam Raising Units: International Combustion, Ltd.

Turbo-Alternators: The English Electric Co., Ltd.

Generator Transformer: The English Electric Co., Ltd.

Station Transformers: British Electric Transformers, Ltd.

Condensing and Feed Heating Plant: Worthington-Simpson, Ltd.

Boiler Feed Pumps: G. and J. Weir, Ltd.

Artesian Wells: C. Isler and Co., Ltd.

Coal Handling Plant: Mitchell Engineering Ltd.

Ash Handling Plant: International Combustion, Ltd.

Circulating Water Pipework: Aiton and Co., Ltd.

High Pressure and Temperature Steam and Feed Pipework: Aiton and Co., Ltd.

Overhead Cranes: Clyde Crane and Engineering Co., Ltd.

River Water Pumps: Drysdale and Co., Ltd.

River Water Screens: F. W. Brackett and Co., Ltd.

Electrofilter Plant: Sturtevant Engineering Co., Ltd.

132 kV Switchgear: A. Reyrolle and Co., Ltd.

3·3 kV and 415 V Auxiliary Switchgear: A. Reyrolle and Co., Ltd.

Main and Auxiliary Cables: British Insulated Callender's Cables, Ltd.

H.P. Valves: Hopkinsons, Ltd.

Consulting Civil Engineers: L. G. Mouchel and Partners, Ltd.

Quantity Surveyors: Wood and Allsebrook.

The project is being engineered by Generation Construction Department, Midlands Division, 53 Wake Green Road, Birmingham 13.

Our readers' views . . .

A Policy on Fires

DO not those who advocate the banning of the electric fire by executive order or fiscal policy forget that coal is not the only mineral in short supply? Steel would not be expensively purchased from America if scrap and iron ore were not difficult to obtain. Whereas the electric fire uses only a few pounds of iron—perhaps eight on average—in its construction, the more efficient types of enclosed solid fuel stove, with which Professor Simon, for example, would like to oust electric heating, have their weight measured in cwt. Even the so-called "improved" type of open fire, with an overall test efficiency less strikingly favourable when compared with an electric radiator, uses 20 or 30 lb of iron. So iron shortage is, while it lasts, an argument against banning the electric fire. And this same argument has its parallel in fuel-shortage considerations. A fair weight of coal is required to produce the iron for the solid-fuel stove, far more than for its electrical equivalent in heat output, and this in turn must be debited against the short-term fuel-efficiency of the heavier appliance. As was stated, Sir, in your article last week, laboratory test efficiencies are far from being the last work in comparisons between heating appliances.

M. L. Sigden

LONDON

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FOR some years I have endeavoured to secure an unequivocal statement on the policy of the Electricity Supply Industry regarding the domestic fire but, so far, success has eluded those endeavours.

The article appearing in your issue of January 31 may be the means of arousing endeavours, in other directions, which will lead to a decision on the policy to be adopted. There are many factors needing consideration before such a desirable point can be reached and those factors must be known to all who have given thought to the subject—factors which involve greater consideration than can be given in a letter such as this.

My intention, therefore, is to restrict myself to the fundamental as to whether the charges now being made by Area Boards are fair. An unusual statement is made in your article; that statement appearing under the sub-title of "Domestic Fires not a Peak Load." It is in the third paragraph and reads as follows: "A cold spell will raise the whole level of the load curve and from some recent examples which we have had an opportunity of studying, the rise in average level of the off-peak load was higher than the increase in peak." I am not certain what is meant by the quotation but it appears to be that a cold spell will lift the whole level of the local curve during off-peak periods to a greater extent than the peak increase. Whether I am right or wrong does not alter the fact that on top of ordinary peak loads unusual heating loads appear during cold spells and these loads are undesirable unless the units supplied, to meet them, bear their proper proportion of true costs. With existing tariffs it is indisputable that any poor load factor heating coming on top of the ordinary peak is not bearing its proper proportion of true costs. I know all about the argument as to postage on letters, but try to telephone Aberdeen for the same cost as, say, to Rugby and disappointment will result.

I think you are doing a service to the industry in raising the subject again and hope it will create greater interest than has been shown in the past.

A. J. Fippard

LONDON, W.1

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VERY many of your readers will want to thank you for having had the courage to put into words what many of us in the electrical industry have been thinking for some years.

It is high time that the industry told the public the truth of the situation. We have writhed with exasperation at the presumption of armchair critics, at their deliberate ignorance of facts, and have watched helplessly the campaign of disparagement and discouragement of not only electric heating, but also cooking and water heating.

What are the facts about electric fires? As I see it, the electric fire is suffering from the results of years of slackness and *laisser-faire*—not of the electrical industry, but of the solid-fuel industry.

For more than fifty years the ordinary open coal fire has remained the principal means of house heating in this country. During that time the open grate has been much improved in appearance, but comparatively little in efficiency. With plentiful supplies of good cheap coal, what need for improvement?

But as soon as a first-class fuel crisis appears, when coal becomes both scarce and dear, then the foolish virgins of the solid-fuel industry turn their attention at last to the task of using domestic coal more efficiently. Naturally, this takes several years, and even now the problem is nowhere near to a solution.

But how, in the meantime, are the public to keep themselves warm?

Faced with little coal in these days and lack of efficient appliances to burn it, what more can they do but to fall back upon their old pre-war friend the electric fire, which, incidentally, is now comparatively economical to use. Who could blame any householder, faced with a fireless grate and an empty cellar, because he uses his electric fire more or less continuously during cold spells in post-war winters such as that we had in 1946-7.

Before the war the average small house fitted with a "sitting-room" back boiler and open grate could obtain—and afford—enough coal to keep the fire going from breakfast-time to midnight. Today such houses, and their families, can only get enough coal to keep the fire going for half that time. The result is that electric fires and immersion heaters have been called in to remedy the deficiency. They are switched on on cold and frosty mornings and the fire is lit later on in the day. Who can wonder that these artificial conditions are one of the causes of load shedding? Sir, I blame the solid-fuel industry for the present spate of hate on the electric fire. If they had shown as much energy in pre-war days in developing more efficient types of domestic grate as they now devote to the condemnation of electric heating, the need to drag in the electric fire to supply the extra heat required would never have arisen.

Because the public has had to turn to electricity in their dire straits, the solid-fuel enthusiasts would seek to restrict the use of electric fires. I say in all sincerity if that industry would only mind its own business and get on with the job of making one cwt. of fuel go as far as two, the public would soon go back to using their electric fires as they did before the war—for auxiliary heating in between seasons and for short hour use where a coal fire is more wasteful and less convenient. Such a load is largely off-peak and can be economically justified at present prices of electricity.

If the solid-fuel industry will put their own house in order first, the electric-fire problem will solve itself automatically without any legislation or "planning."

BM/SRHQ

LONDON, W.C.1.

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Underfloor Duct Systems

I WAS most interested in Megohm's informative article on Underfloor Duct Systems in your issue of February 7, but would like, if I may, to correct one small inaccuracy. Non-metallic ducts can be laid within screed of less than 3 in. and in fact the system mentioned as 1 in. by 4 in. has, for single duct work, been housed satisfactorily in a screed depth of only 2 in.

F. V. Wickham

LONDON, E.C.4.

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Heating Trains

IN your issue of January 31 you gave a short description of the new Western Region gas turbine locomotive No. 18,100. While this description was mainly confined to the electrical system, I was, nevertheless, rather surprised that no mention was made of the train heating system. This is, I understand, provided by a separate boiler carried by the locomotive and oil fired. Experience with the Brown Boveri unit, and with the two Midland Region diesel-electrics has shown that in winter conditions at least, the heating so far provided has been inadequate to serve a train of normal length. All these units have used the separate boiler system.

I further understand that in No. 18,100 the exhaust at full load is at a temperature of about 450° F, and with the quantity of air passing through the turbine this must represent a substantial portion of the losses. It would seem obvious, therefore, that a comparatively simple form of heat exchanger in the exhaust system could supply a large proportion of the heat required for passengers' comfort.

It would be interesting to know whether there are technical reasons sufficiently important to preclude the use of waste heat in this manner, or whether the possibility of using this heat has not yet been sufficiently investigated.

C. Oppenheimer

LONDON, W.C.1

Earthing

and EARTH LEAKAGE PROTECTION

By T. C. GILBERT, M.I.E.E.

At an I.E.E. meeting held on January 17 this year, Mr. N. Elliott, A.M.I.E.E., an Electrical Inspector of Factories, summarised a paper he had prepared advocating that where earth leakage circuit-breakers of the voltage-operated type are installed, the installation they protect should be provided with a connection to earth quite separate from that obtained via the trip-coil of the e.l.c.b. We presented Mr. Elliott's argument on page 147 of our issue of January 24. He suggested in particular that the parallel earth connection would give greater safety when the resistance of the supply transformer neutral-earth connection was high compared with the local installation earth connection resistance. In the present article Mr. T. C. Gilbert, M.I.E.E., well-known expert on earthing and installation problems, criticises some aspects of the suggestions made by Mr. Elliott.

IT is devoutly to be hoped that the movement now clearly discernible in certain quarters, to make the direct earth connection in parallel with the voltage-operated earth-leakage circuit-breaker earth connection standard practice, will not be pressed to I.E.E. Wiring Regulations Committee level and made mandatory under Regulations. At present, Regulation No. 1006 and its associated Notes recognise the alternatives of (1) earth leakage protective device alone; and (2) a direct earth connection in parallel with the protective device, which seems reasonable. If any user feels inclined to parallel both methods he is at liberty to do so, on his own responsibility, but it is contrary to the spirit of our regulations that he should be compelled to endorse and practise a method to which he may, understandably, have certain objections.

It is difficult to understand this obsession with the direct earth in this country, in view of the contrary opinion held in all other countries using voltage-operated leakage protection on any large scale, and the complete and absolute unreliability of earth continuity conductors and earth electrodes as brought to light with the recently-issued E. R. A. Report V/T109, "The Incidence and Avoidance of High Resistance Joints in Steel Conduit Runs in Service," and a paper read before the Utilisation Section of the Institution. The writer's main objections to direct parallel earthing with voltage-operated earth leakage circuit-breakers are three, although others can be advanced; these are:

(1) Regulations require earth leakage protection where direct earthing is doubtful or dangerous; why retain the suspect method?

(2) The use of the parallel earth connection precludes easy testing of the earth continuity conductor *from the appliance itself.*

(3) With a parallel direct earth in being there is serious risk of connection of the protective device earth to the same electrode, resulting in short-circuiting, or the installation of the protective device earth within the sphere of influence of the direct earth electrode, probably stultifying protection by the former.

Checking Protection

Regarding (2), the use of the parallel earth does not prevent the checking of the circuit-breaker mechanism and its earth connection by means of the test key, but more than this is required in practice. Unreliability of continuity exists all the way from the appliance casing through the earth continuity conductor to the earth electrode, and this whole fault path must receive occasional check. Normally this is done by shorting-over the phase to the appliance casing, and with the leakage trip alone in circuit represents an adequate check, carried out under practical conditions; with a solid earth in parallel with the leakage protective device fuses would probably be blown and damage caused with this check, with the result that users and inspectors would hesitate to apply it. The better the direct parallel earth the more likely it is that serious damage would be caused if any such simple check were applied.

The advocates of the parallel earth method say, is it not better to have a designed direct earth in parallel with the leakage protective device than a fortuitous one somewhere back in the circuit? This is rather like saying, is it not better to break your neck deliberately rather than run the risk of having it broken in a traffic accident? For one thing, the writer

has never yet encountered a fortuitous earth of negligible resistance, and it thus becomes merely another resistance shunted across the trip coil and its electrode impedance, with consequent division of currents and potentials, but certainly not a short-circuit. It may be assumed that a designed parallel direct earth will have as low a resistance as it is possible to secure, and cannot thus be compared with any fortuitous earth contact elsewhere.

Untested and unchecked earth leakage protection is a snare and a delusion, and any method of installation that prevents this test being as complete as possible should be condemned on this one ground alone. The ideal is, of course, automatic indication of failure at some point, but for the time being we have to be content with placing the protective device within easy reach of the user, preferably at each piece of equipment or apparatus, and train him to use the test key for rough check; the completer check can be made by his contractor, or others, at intervals, but the important point is, it must be possible for this check to be made without risk of fireworks or damage.

Regarding (3), the writer has come across several cases where the parallel method has been used, with both earth connections made to the same electrode, thus stultifying any possibility of protection by the earth leakage circuit-breaker. In other cases, the two independent electrodes have been driven too closely together, with the potential gradient of the direct earth connection embracing the protective device earth, resulting in too low a potential across the trip coil for any certainty of operation. Note (iv) to Regulation No. 1006 draws attention to this danger, but it is not everybody who installs leakage protection devices that studies regulations. The only way to eliminate the risk is to abandon the direct earth connection.

Beware Regulations!

Most installation engineers would be content to leave matters where they are—those favouring the parallel method being free to use it, but others having choice of either. In the writer's view it would be a seriously retrograde step to accept pressure, however well intentioned or from whatever quarter it may emanate, to make the parallel method mandatory, but if we don't look out it may creep upon us. Few of us are favoured with a glance at draft regulations before they are incorporated in a new edition, and the only way in which our views can be expressed is through the technical Press.

British Standards

Cotton-covered Round Copper Wires. *B.S. 1791, 1951. Price* 2*s.* Following on the recent publication of the revised edition of B.S. 156, "Enamelled round copper wire (oleo-resinous enamel)", the British Standards Institution has now published a further standard in the series on wires having various types of covering and intended for winding coils for electrical machinery. In this new standard the cotton covering consists of one or two layers, in which the cotton is applied by winding the yarns helically round the wire and does not apply to other kinds of cotton covering, such as braiding. All commonly-used sizes of wire from 0·0060 to 0·192 in. in diameter are included, together with full details of the cotton covering to be applied to them, elongation of the covered wire and measurement of conductor diameter and overall diameter.

Dimensions of Conduit Dies. *B.S. 1813, 1951. Price* 2*s.* Conduit dies, guides and stocks of the type used by electrical contractors are the concern of this standard. Simplified ranges have been standardised with a view to securing the greatest practicable measure of interchangeability. The principal dimensions for three sizes of dies with corresponding guides and stocks are provided, and recommended screwing ranges of B.S. conduit threads for each size of die are given.

Gears for Turbines and Similar Drives—Part 1: Accuracy. *B.S. 1807: Pt. 1, 1952. Price* 3*s.* 6*d.* This standard applies to the accuracy requirements of high grade gears used in the drives for turbine and similar plant, but it does not at present cover tooth form or gear loading. It includes three classes of gears, of which Class A1 and Class A2 are generally appropriate for pitch line speeds in excess of 10,000 ft per minute or where any other factor demands the highest grade. The standards of accuracy laid down for Class B would generally be appropriate for lower pitch line speeds. It deals with the nomenclature of double reduction gear trains and the accuracy of reference surfaces on the blanks.

The section relating to wheels and pinions deals comprehensively with the permissible errors for undulations, transverse pitch, axial pitch, tooth thickness and backlash. Work is proceeding on the preparation of Part 2 of the standard, which deals with tooth form and gear loading.

Copies of these standards may be obtained from the British Standards Institution, Sales Department, 24 Victoria Street, London S.W.1., at the prices stated.

Distribution Economics

Keeping down network costs per consumer

DISTRIBUTION networks for housing estates laid down at a cost of only £25/consumer are suggested as possible in a paper, "The Economics of Low Voltage Electricity Supplies to New Housing Estates," which was presented at a meeting of the I.E.E. in London on Thursday last. The author, Mr. F. G. COPLAND, B.ENG., A.M.I.E.E. (N.W.E.B.) contends that domestic supplies are heavily subsidised by the other loads of electricity boards. From this he argues that methods of l.v. distribution hitherto regarded as standard require drastic revision to bring the overall costs/consumer nearer to the economical figure.

As a basis for design, Mr. Copland suggests that cable networks should be laid down to provide for load growth to the end of their 40-year amortisation life. By this time it is suggested that the after diversity maximum demand per consumer will have risen to 3 kW. Due to phase unbalance, the ultimate maximum phase load of a consumer is taken as 4 kW, and cable loading and maximum voltage drop calculations are based on this figure. For the calculation of losses an r.m.s. value of 1·47 kW is assumed for maximum demand over the 40-year life, associated with a load factor having a mean value of 37·5%.

The nearest approach possible to the theoretical cable loading for maximum economy is achieved by loading distribution cables to their maximum current carrying capacity. This principle is applied in the design presented in the paper, and advantage is taken of town planning arrangements to assume that the designed limits and density of a newly-built estate are final; no provision need be made for future extension of any network designed to supply it.

Network Design

As a basis of design a substation with eight radial distributors was considered, loads away from the routes of the radials being fed by transverse branches. Analysis of the results of applying this idea to actual schemes showed that, irrespective of the radius of the distribution area, the average length of radial plus outer-branch distributor was within 3% of that of the theoretical network. Number and length of inner branch distributors were proportional to the radii of the area.

The equation is derived, $l = 8(2{\cdot}82r + 1{\cdot}53rK)$ where l is the length of the l.v. network, r = radius of unit distribution area $\div \sqrt{3}$, and K is a correction factor representing the length of inner branch distributors as a fraction of the theoretical value. K varies linearly from only 0·4 for 200 yd radius distribution area to 1·5 for 300 yd. Inner branch distributors can be of smaller cross-section than the radials and outer branches, and voltage drop limitation is the usual design criterion.

Size of unit distribution area is a function of consumer density and of maximum permissible cable loading. At a density of 40 kVA/acre and 3 kW a.d.m.d. it varies from 148 yd with 0·0225 sq in. radials to 319 yd for 0·3 sq in. Corresponding figures for a 4 kW a.d.m.d. are 124 yd and 279 yd.

Costs

Network costs on a given basis of lead and copper prices, using 6·6 kV h.v. supplies, are calculated in the paper, and the results indicate that maximum economy is obtained by the use of 0·04 sq in. or 0·06 sq in. cables. After allowing for possible additions to h.v. circuit costs, it is concluded that the most economical solution lies in the use of 0·06 sq in. l.v. cables, while exceptional conditions may justify the use of 0·10 sq in. cables.

Under the condition of unbalanced load assumed the maximum voltage drop is 6·7%, and this, it is felt, may too much cramp the design of the h.v. circuit. Design on a basis of 4 kW a.d.m.d. overcomes this.

No provision is made for alternative supplies in the event of a fault, as the author considers the need for such provision to be unlikely.

Records available in the N.W.E.B. area, covering the performance of 1,300 miles of l.v. underground distributors over a period of 10 years, show that the average fault incidence is 1·8/100 miles of distribution/year. The cables concerned include many laid in aged networks in city streets, and it is suggested that it is reasonable to assume that modern cables laid on housing estates, well clear of roads carrying heavy traffic and not subject to periodic disturbances for purposes of building or attending to other services, will have a considerably lower fault incidence. A 400-yd distributor supplying 32 consumers is thus exposed to a maximum

risk of 6 : 1 against a single fault during its life of 40 years.

Plans and calculations included in the paper suggest a close agreement between costs calculated on the basis of the theoretical unit distribution areas, and detailed calculations on actual plans.

DISCUSSION

MR. O. HOWARTH (N.W.E.B.) said that while they were satisfied that the figure of 3 kW after-diversity demand given by the author was a safe maximum, there was considerable evidence that housing estates with solid fuel heating and electricity as the only alternative service had an after-diversity demand of less than 1 kW per house. Shortly after vesting day, various schemes for supplying housing estates on conventional lines had been put before his board which would have cost about £60 per house, including services. The average domestic consumer took 1,300 units per annum and produced a revenue of about £8 per house. A revenue of £8 against an expenditure of £60 was not a commercial proposition. The board connected about 10,000 houses per annum on housing schemes, and at a total cost of £40 a revenue of £8 was equal to 20% of the capital figure.

MR. D. B. IRVING (L.E.B.) maintained that the old concept of relating the immediate revenue return on a particular extension to the capital cost of that extension, with no regard to previous capital expenditure, must give way to a consideration of the picture as a whole. Those concerned with distribution must remember that they had been able to carry on so far mainly due to the reserve strength provided in their distribution systems by former generations of engineers.

MR. R. H. ABELL (S.E.B.) said that on the basis of 12 examples his Board found that the cost of providing a supply to housing estates was about £30 per house with modern designs. A balanced load was very important, and their unbalance was of the order of 20%. The average return on estates to which he referred was £10 to £15 house.

MR. W. HILL (M.E.B.) suggested the use of under-eaves construction for the last 10 to 20 houses on each distributor, which should cut service costs to about one-third and prevent bad out-of-balance. He also suggested reasons for which it might be possible to uprate cables by 30-35%.

MR. G. H. FOWLER (L.E.B.) contended that the author had achieved economies in two main ways: by having absolute faith in his knowledge of the future, and by throwing overboard the traditions of the electricity supply engineer. There were a number of networks in the country to-day which had been designed on a graded system, gradually reducing the diameter of the cable, the designers thinking that they knew where the load was going to be, and they were the ones which caused the most trouble, because they could not be reinforced. Was the author in any better position to forecast the future than the designers of those days?

MR. P. SCHILLER (B.E.A.), emphasising the importance of work of the type done by the author, said that from figures recently collected he was afraid that a substantial number of housing estates had been connected since the war at a cost of £50-£60 per house. One advantage of being a nationalised industry was that this kind of problem could be tackled by experts.

MR. R. A. W. CONNOR (E.E.B.) suggested that the author's figure of 1,000 kW/h as the consumption by a new consumer in the first year of supply was low; in the area with which he was concerned their average figure was about 1,500 units, and their average revenue per house was over £8, and from new housing estates might well be over £10. The industry in the past had built on attractive tariffs and abundant and continuous supply.

MR. B. D. YOUATT (Y.E.B.) said that although there was very good theoretical justification for a network of 0·0225 in conductors, and they would save a lot of copper, it was just as well to leave oneself plenty of elbow-room in these tailor-made networks, as otherwise expensive reinforcement might be needed later.

MR. B. CROWSLEY questioned the author's statement that the domestic consumer was subsidised by other consumers and also thought that the figure of 3 kW for the after-diversity maximum demand per consumer was very high. In a district with a saturation of 60% cookers and a high degree of saturation of other apparatus the average maximum demand on the station busbar, he said, was just under 1¼ kW on weekdays and just over 1½ kW on Sundays.

MR. G. W. LEE expressed the view that the value of the paper was its use of an analytical approach which had produced a "ready reckoner." He did not agree with the author's conclusions, and in fact hardly agreed with anything in the paper, but he regarded the ready reckoner as of great value, because at least he knew what it was that he was not agreeing with.

MR. J. ECCLES (M.N.W.E.B.), challenging the statement that the domestic consumer was subsidised from other loads, said he would be glad to take over all the author's domestic consumers along with his own and make a profit, while the author, keeping the others, would make a loss.

MR. J. L. EGGINTON suggested that in many cases it paid to run a distributor down one side of the street only and take services across the street to blocks of two or four houses.

MR. E. C. I. MACDONALD recalled that 25 years ago Beard and Haldane had written a paper on the same subject, and arrived at many conclusions similar to those of the present paper. They differed from it, however, on the question of cable sizes, and in contemplating a progressive expansion of load, so that they achieved considerable economy by not spending money on material and work which were unnecessary in the early stages.

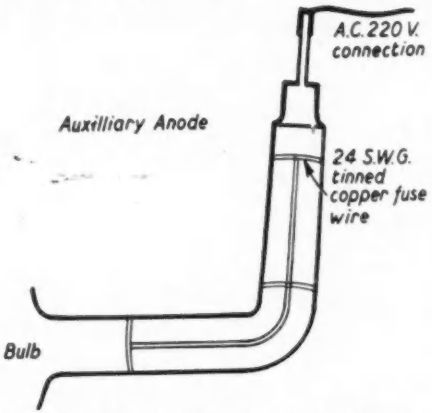
The Author briefly replied.

Problems and Practice

IN ENGINEERING

Grid Control Flaw

A MERCURY arc rectifier with grid control was installed in a factory. This was to be used for supplying d.c. power at 460 V to the motors of a wire drawing machine. The input a.c. voltage to the main anodes on the bulb was 440-3 phase. The input voltage to the auxiliary anodes was 220 a.c. 3 phase. The purpose of the auxiliary anodes was to supply



the field current to the motors at 220 d.c. also the pilot lights, relay circuits, and solenoid coils of the dynamic braking.

The bulb performance was satisfactory for a period of six months, then it was noticed that when the wire drawing machine was stopped and no load on the rectifier bulb, the pilot lights were blinking, and the relay contacts were chattering. An examination of the rectifier bulb disclosed the disturbing fact that at no load, there was not sufficient vapour rising from the mercury to keep the auxiliary anodes constantly ignited, with the result, two of the anodes would function, and the other one, miss intermittently, thereby causing a "stutter".

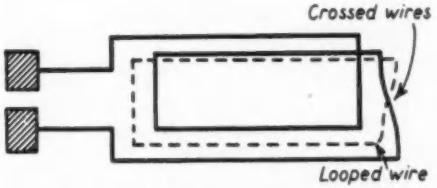
Various cures were tried including tilting the bulb, and fitting a "ballast" resistance to create an artificial load, but all to no purpose.

The cure after much experimenting was as follows: On the auxiliary anode "horns" 24-gauge tinned copper fuse wire was lapped twice round the glass at the top, then carried down and lapped twice round the half-way position, then carried on and lapped twice round near where the anode joins the bulb. The whole of the glass anode was then painted with liquid graphite. This had the effect of giving the arc inside the glass a directional effect, with the result, once ignition had taken place, the arc instead of dispersing over a wide area, directed itself in the shortest path to the mercury pool.

Since this treatment, no further trouble has been experienced, but I understand other wire-drawing maintenance staff have had similar trouble, so perhaps this suggestion may save a few headaches. —*T. McG.*

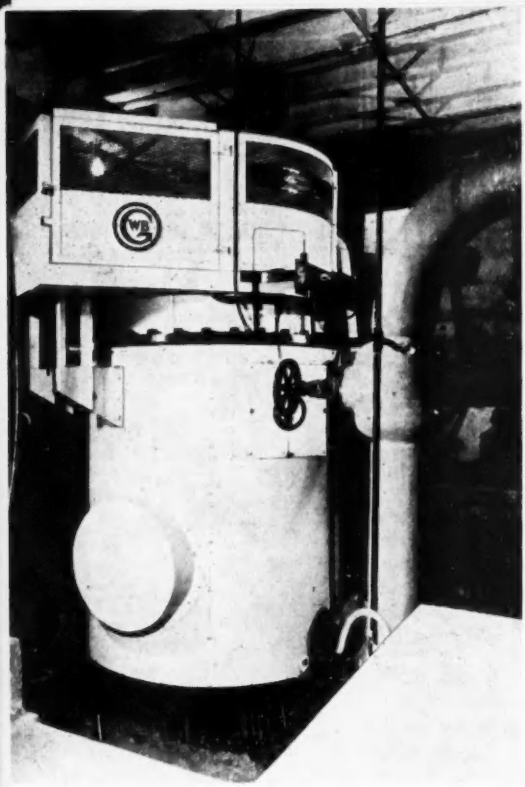
Hot Armature Core

THE writer had trouble regarding a 2-pole d.c. crane motor of which the armature had been recently rewound. The nature of the trouble was evidently due to shorted com bars or a shorted coil for the core of the armature was hot at a particular part. The armature was removed and a drop test applied. Although the result of the test indicated a defective coil, the reading shown on the instrument was only a degree less than that of other coils under test.



Winding, showing crossed coil connections

On examining the defective coil it was observed that the evolute had been retaped. Further, when removing the tape it was found that two of the wires had been rejoined. It was suggested that another drop test should be applied with the two wires reconnected in the reverse order. The experiment proved a success, for on carrying out the test the readings round the commutator were the same. The cross-connection was tantamount to a shorted coil, as the looped wire (see sketch), was generating a local e.m.f., ultimately heating up the core.—*Novis.*



Thermal Storage Heating

Installation at N.W. Division Headquarters of the B.E.A.

IN order to improve the load factor, and to avoid adding to the peak load, the North Western Division of the B.E.A. has installed a thermal-storage space heating system in its headquarters at Didsbury. Apart from the usual advantages of cleanliness, and ease of control inherent in all types of electric heating, the installation has sufficient automatic control to enable it to dispense entirely with the need for attendant labour, and at the same time to give highly efficient operation.

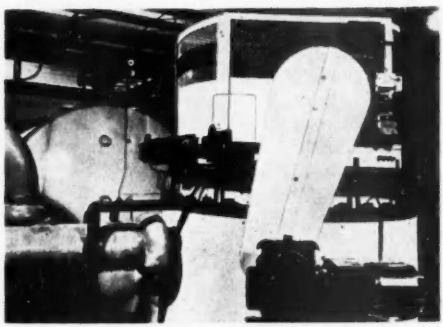
Requirements

The thermal load of the building, allowing for future extensions, was estimated at 2 million B.Th.U.s per hour with an external temperature of 32° F. with an internal temperature of 65° F. For the purposes of calculation it was assumed that the hours of occupancy would be from 9 a.m. to 5 p.m. and it was deemed advisable that the structure should not be allowed to go "cold" during the night. A circulation to the extent of one third of maximum load was therefore allowed during the night hours between 5 p.m. and 7 a.m. with a two hours pre-heating boost between 7 a.m. and 9 a.m. It should be noted that for buildings of heavy structure, it is more economical to provide heat of varying amounts throughout the twenty-four hours than to switch off heating entirely at the termination of occupancy.

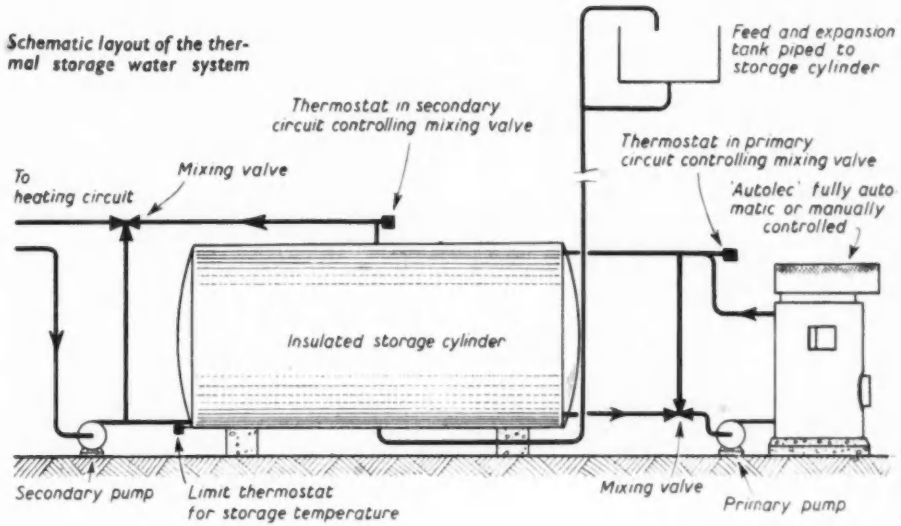
The Installation

Primary heating is provided by an 800 kW "Autolec" high tension electrode water heater made by G. W. B. Electric Furnaces Ltd. of Dudley. Hot water at 230° F. is fed from this, by a high velocity pump system to the storage cylinder system, the necessary head to allow safe working at this high temperature being given by a secondary feed tank on the roof, which has a capacity sufficient to accommodate the expansion of all the water in the system. Total storage capacity is about 32,000 gallons.

In a system of this nature, it is essential that an even temperature gradient be maintained within the storage vessels and to assist this, an automatic mixing valve is installed on the primary side of the circuit before the high velocity pump. This eliminates any possibility of water at other than the correct temperature entering the tank. Contained within each cylinder are three thermostat pockets situated at the top, centre and bottom. Since the temperature within the vessel is a maximum at the top and a minimum at the bottom, by inserting the controlling thermostat in any one of these pockets, the Electrode Boiler can be closed



Side of electrode boiler showing control gear. Storage tanks in background


Feed and expansion tank piped to storage cylinder
Thermostat in secondary circuit controlling mixing valve
Thermostat in primary circuit controlling mixing valve
To heating circuit
Mixing valve
'Autolec' fully automatic or manually controlled
Insulated storage cylinder
Secondary pump
Limit thermostat for storage temperature
Mixing valve
Primary pump

Schematic layout of the thermal storage water system

down after any pre-determined level of storage within these limits has been obtained. Thus, in mild weather, the thermostats can give only one-third or two-thirds of the heat storage.

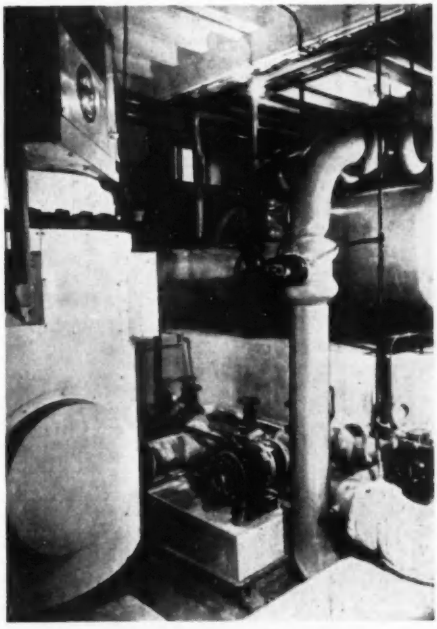
On the secondary side of the storage vessels, a normal low-pressure heating scheme is employed, provision being made for domestic hot water. Flow and return design temperatures are 180° F. and 150° F. respectively. A further mixing valve is installed in the secondary flow main, the control being exercised by a thermostat installed in the secondary flow following the mixing valve.

This thermostat operates in conjunction with an outside temperature controller by means of a pilot acting through a calibrator box, so that in the event of the external temperature rising, the flow temperature of the heating circuits will fall in sympathy and vice-versa. Thus the temperature within the building remains constant despite fluctuations in the outside conditions.

A time switch included in the secondary system mixing valve circuit switches the heating system over to night temperature operation which maintains the building temperature some 10° F. below daytime working. Compensation with outside temperature is still maintained in these circumstances.

Although in this particular building the final heating is by means of radiators, considerable economies could be made by the installation of an embedded ceiling or floor panel heating scheme. In these latter systems the return temperatures are very low and a considerable reduction in storage capacity.

Domestic hot water is provided by a calorifier which is served from the heating mains from the storage plant during the winter, and by electric immersion heaters in summer when the heating system is closed down.



Another view showing tanks and pumps

The Electrode Boiler

The electrode boiler used in this installation is a G.W.B. high tension water heater made to operate on a 6,600 V, 3-phase, 50 cycles supply direct on to the electrodes, and rated at 800 kW. All control gear, motors, etc., operate on 415 V, 3-phase supply.

The unit is of the fully automatic type in so much that it has automatic rating control by which the rating of the unit varies itself in accordance with the demand placed on it. Also it is equipped with automatic temperature control. By using this control, the working temperature can be selected at a master thermostat, and the unit will maintain the flow temperature to within a few degrees of the selected figure. Both temperature and rating controls operate by the moving of high tension porcelain shrouds over the electrodes, the actual moving of the shrouds being carried out by a central driving shaft through the top of the boiler, which is in turn operated by a small electric motor via gear box, gear trains, slipping clutches, etc. The whole drive unit is enclosed, equipped with electric brakes and all the necessary lubricating equipment to ensure silent and trouble-free operation.

The interior of the boiler is extremely simple, the only moving parts being the porcelain shrouds which are manufactured from high-density porcelain and tested to 1,200 lb/sq. in. There is no interior circulating pump supplied with this equipment, nor has it been found necessary. The whole boiler equipment is completely interlocked and fitted with all the necessary safety devices which include phase failure, protection overload, no-volt, and h.t. interlocks which prevent high tension supplies being switched on until all parts of the system are in operation and l.t. supply is available. The equipment also includes protection against changes of pressure due to water loss or steaming within the boiler.

The whole equipment is controlled by a master time switch which, amongst other duties, ensures that primary pumps are in operation some quarter of an hour before h.t. becomes available to the boiler. This time switch also controls the whole sequence of the thermal storage plant operation, no manual control being needed whatsoever.

Excess temperature thermostats are fitted to all tanks and also to the electrode boiler itself which ensures that h.t. is switched off at the main switch should a dangerously high temperature be reached in the system.

Acknowledgments are made to Messrs. G. N. Haden and Sons, Ltd., of 4 Albert Square, Manchester 2, Mr. Trolan of the B.E.A. Didsbury, and Messrs. G.W.B. Electric Furnaces, Ltd., Dibdale Works, Dudley, Worcs., for the information above.

Factory Heated Electrically provides Off-Peak Load

DEVELOPMENT of heat storage blocks in Ireland has received publicity; but less well known are experimental installations in the U.K., using a wide variety of storage media other than water. A case in point is at Tamworth, where Woolleys, who back in 1947 launched the now-popular metal block type of dairy steam raiser, have been experimenting since 1949 with blocks for air heating.

With an eye on the many small "one shift" factories in the large industrial cities where electricity is bought on a maximum demand tariff, and where individual coke stoves are used for heating the works, this firm has produced a multi-unit heat storage installation, where each unit is loaded 3 kW and occupies a floor space of 2 ft frontage by 2 ft 6 in. depth.

For extracting the heat, use is made of an electric fan, with ducting as required. It is claimed that the blocks can store heat for up to 12 hours, switching being by time switch with contactors. Owing to the exceptional heat insulation there is little heat loss during the storing period.

In the type of factory for which this plant has been evolved, the heating installation has often been in the nature of an afterthought. So it was considered that if any alternative was now to receive consideration, its capital cost must be low, therefore, the plant at Tamworth

TABLE 1. RATE OF HEATING IN EXPERIMENTAL SHOP

Thermometer readings on morning of February 6, 1952, in positions shown in Figure 2.					
Time	A	B	C	D	E
0715	Time Switch cuts out.				
0729	43	43	44	44	40
0730	Fan on. Three dampers opened.				
0740	53	53	50	50	40
0740	Two dampers re-closed.				
0750	55	55	54	54	40
0830	54	54	53	53	40
0930	55	53	55	54	42

Fig. 1. Shop foreman regulates the dampers of an experimental 3-kW heating plant

relies on manual operation of dampers. Automatic control, while it could effect economies in consumption and better regulation, might make the capital cost too high.

Industrial Heater

In 1949, it was the firm's intention to develop a storage heater for home and office use, and considerable development work was done to this end. But the plan was shelved, so we were told, because of the vagaries of purchase tax, the delay and subsequent lack of inducement in the nationalised electricity tariffs, and owing to the mounting cost of both coke and labour in the small factory. An industrial type of heater became the better proposition.

It was decided later on to fix a plant in the new experimental shop then being built by the associate company, Electrobloc Ltd. This work was done last summer. The building so heated consists of a 60 ft by 40 ft corrugated iron structure, on high ground, exposed on all four sides, and with windows 4 ft by 2 ft spaced at 10 ft centres. The roof and interior walls are lined with asbestos board, and an 18 ft by 18 ft corner is partitioned off. Within this corner space is an office 12 ft by 15 ft heated by a 1 kW heat storage convector, whose consumption is excluded from the figures which follow.

Necessary Temperatures

For the type of factory which Woolleys have in mind, an air temperature of around 50 to 55° F is usually sufficient, but, maybe, only provided that the workers can see the glowing stove and can walk to it from time to time either to shovel on more coke or merely to toast their fingers. The first half of this winter at Tamworth has been too mild for proper judgment to be formed on this point.

During the 3 months ending December 1951, the 22,000 cu ft of space so heated took approx. 9,000 kWh for a night demand of 9 kW, and a kWh cost of just under £25. The colder weather in January, with outside temperatures below freezing point, called for a 15 kW demand, but not for full storage. Woolleys think that 15 kW will be enough even for the colder weather to be expected in March, but even if 18 kW should be needed, that figure is still below the daytime maximum demand in the shop.

The quick rise of inside temperatures is illustrated in the table—15 minutes being the objective. Had the day's starting temperature been lower, more dampers would have been opened during the initial heating period.

Will the critics of the electric fire say that this sort of heating installation, with its obvious cleanliness and labour-saving features, is a waste of the national fuel resources?

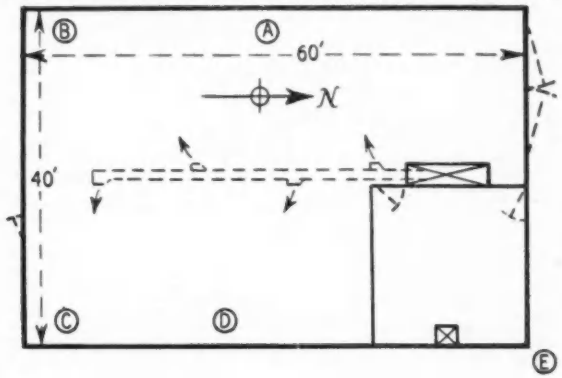


Fig. 2. Plan of the experimental shop in which the temperature readings given in the table on the opposite page were obtained. Circles round letters indicate positions of thermometers

Progress in Production during 1951

GENERAL ELECTRIC CO. LTD.

THE highlight of works development during the year 1951 was the opening by Sir Harry Railing of the new heavy engineering works at Witton, Birmingham, which is expected to double the output of large generating plant, winder, rolling mill and ship propulsion motors.

Orders received from the B.E.A. for 75,000 kVA hydrogen-cooled turbo-alternators bring the number of such sets now in hand up to a total of 12. Other home orders include a fifth 37,500 kVA set for Woolwich and two of this rating for Huncoat power station, Accrington, and a geared, pass-out set is on order for Keynsham Paper Mills. Orders from abroad have been received for turbo-alternators for the Vryhoid Colliery and Bloemfontein, South Africa; from Demerara, British Guiana, and Mackay City Council, Australia; and for a turbo-compressor from the Harmony Gold Mining Co. of the Rand Mines.

Equipment delivered overseas includes a third motor-driven blower for the Iron and Steel Corporation of South Africa, and two 47,500 kVA turbo-alternator sets for the Orlando power station, Johannesburg, for which five further 37,500 kVA sets are in hand. Equipment put into commission includes turbo-alternator sets for Wide Bay Electricity Authority, Queensland, the Athens Electric Co., the United African Co. and West Bokaro Ltd., Calcutta. A 30,000 kW set has been delivered to Haifa power station of the Palestine Electric Corporation and a 25,000 kVA set to the Allenwood station, Eire.

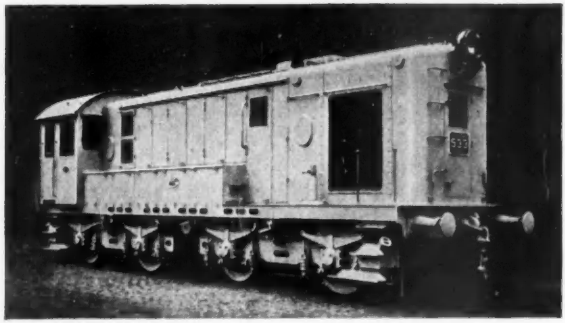


Fig. 1.—Diesel electric loco for Ceylon Government

Transformers and Reactors

For the Huddersfield station of the B.E.A., two 45,000 kVA and two 37,500 kVA transformers are on order. For the Whitehead Iron and Steel Co. Ltd. two 20,000 kVA transformers and seven outdoor reactors are under construction. Two 45,000 kVA transformers have been built for Cheltenham and the second of six 70,000 kVA generator-transformers for Uskmouth has been delivered.

Export orders in hand include 25 outdoor transformers for the Government of India, of a total capacity of 160,000 kVA and three 16,000 kVA outdoor transformers for the Saltos del Sil Power Authority, Spain.

A notable advance in the field of measurement and protection is the development of a prototype 132 kV fully impulse-tested voltage transformer. Another interesting development is the use of reactors enabling single-anode mercury arc rectifiers to operate directly on a three-phase supply without a transformer.

Transformers free from fire risk have been built in which the cooling is by air circulated by fans through the cooling tubes.

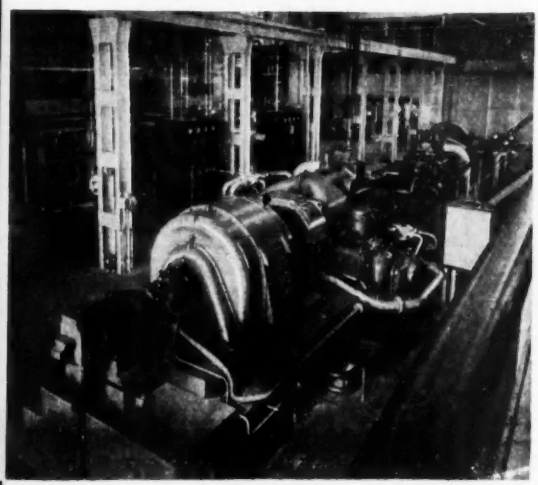


Fig. 2.—The power station at Travancore Rayons Ltd., India, showing two 1,500 geared turbo-alternator sets. These are totally enclosed and are arranged for a closed circuit system of ventilation

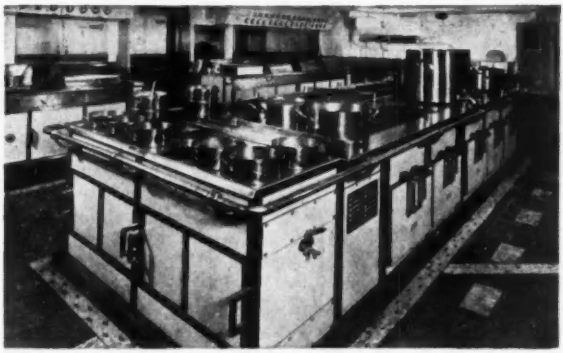


Fig. 3.—Cooking equipment in the main galley of the "Ocean Monarch"

Switchgear

Twelve 132 kV outdoor-type oil circuit-breakers, each with a breaking capacity of 2,500 MVA, are on order for Meaford "B" generating station. Outdoor switchgear for six complete substations is on order for the Hirakad Dam project of the Government of India. Much outdoor switchgear is also on order for the State Electricity Commission of Victoria and for Sydney County Council, who have also placed an order for a 22-panel heavy-duty metal-clad switchboard for the Homebush substation. Other contracts for metal-clad switchgear are in hand for the Swartkops power station, Johannesburg, Nechells power station, Birmingham, and the London Electricity Board. Included in the considerable quantity of equipment supplied to the coke preparation plant of the N.C.B. at Nantgarw Colliery, South Wales, is a 15-unit, four-tier cubicle type contactor board for motor control.

Cables

Two types of cable recently developed are insulated with special quality asbestos paper and sheathed respectively with welded aluminium and welded stainless steel. They are non-inflammable, non-ageing, fire-resistant and maintain their electrical properties at high temperatures. The steel sheathed cable has great mechanical strength, and being resistant to corrosion is particularly useful in chemical and rayon factories. Non-plumbing type terminating glands are available so that indoors no sealing of glands is necessary owing to the high resistance of the insulant to moisture.

Mercury Arc Rectifiers

The first single-anode, grid-controlled, air-cooled pumpless rectifier embodying the side arm principle has been developed. It is especially suitable for three-phase full-wave rectification which from a three-phase supply, gives a smoothness equivalent to six-phase rectification.

The first group of 1,200 kW 1,500 V six-phase rectifiers, representing ten of the 16 under construction, has gone into service with the Netherlands Railways. High speed electronically applied arc suppression is incorporated as a standard feature. Three 1,200 kW rectifiers are in service on the Rotterdam Tramways. Two 1,000 kW 550/470 V grid-controlled transportable rectifier equipments for Buenos Aires exemplify the adaptability of pumpless rectifiers for traction service. They provide a 1,100 V supply for street railways, 550 V for light traction or 470 V for industrial requirements.

Traction

Early in 1950, an electric locomotive and coaches were put into service on the Estoril Railway in Portugal. A further order for nine motor coaches, four driving trailers and a trailer coach has been received.

Eight Diesel-electric locomotives have been completed for the Ceylon Government Railways and most of them are already in service.

Fig. 4.—High frequency edge glueing machine for the production of block board on panels

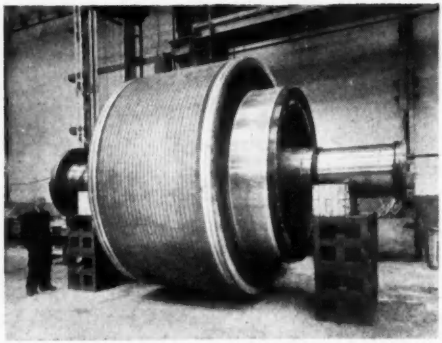


Fig. 5.—Armature of the 5,000 h.p. 700 V cogging mill motor for Richard Thomas and Baldwin Ltd., Redbourn

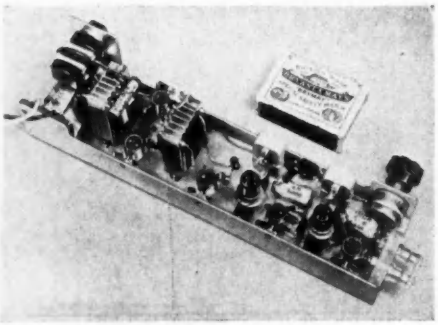
They are of the 2-bogie, 4-axle type, each weighing 54 tons, designed for use on a 5 ft 6 in. track and will be employed for general yard shunting and hauling goods trains on branch lines. The main generator is driven by a 625 h.p. Paxman Diesel engine and supplies power to the four traction motors.

Forty 3,000 V, 3,000 h.p. main line locomotives for the South African Railways and Harbour Administration are being erected.

Following earlier contracts seven additional heavy-duty battery-operated locomotive equipments have been completed for the London Transport Executive. The batteries have a capacity of 1,008 amp/hr at the five-hour rate; there are 160 cells per locomotive. Their use is mainly for new construction, cable-laying, track maintenance, and for accidents.

Deliveries have been made of trolley bus equipment for Cardiff, and Hobart, Tasmania. An improved type of rheostatic brake has been operating successfully for a year on a bus of the Reading Corporation. It not only gives a rather more suitable shape of braking curve, since the braking effort is maintained almost to standstill, but also results in the copper in the motors being used more efficiently.

Fig. 6.—Radio receiver using germanium triodes instead of thermionic valves



Lighting

The luminous efficiency of the 1,000 W mercury lamp for high bay lighting has been increased from 45 to 48 lumens per watt. A 2½ kW a.c. cadmium mercury compact lamp has also been developed. Lamps with a filling of Krypton isotope 84 yielding nearly ideal monochromatic radiation are being considered in connection with the establishment of an international standard of length in terms of a wavelength of light.

Due to the popularity of silica-coated lamps, the range of "Silverlight" lamps has been extended up to 200 W. A range of lamps with natural colour glass bulbs for dark rooms will be available shortly. Blue-coated Photoflash bulbs for outdoor colour photography are being developed.

Special manufacturing and testing equipment is now in use in the production of lamp control gear. A jig has been devised to clamp, set and weld the 40 W brick choke used with fluorescent lamps. Another development is an apparatus for measuring the thermal conductivity of high melting point bitumens used in brick chokes.

A lantern for side street lighting with 45 or 60 W Osram sodium lamps has a die-cast light alloy body with "Perspex" refractor plates cemented directly on to a "Perspex" bowl.

Heating Developments

A notable achievement in process heating is a new type of continuous decarburising furnace which occupies a minimum of floor space and gives very high processing speeds. A recent installation for continuous decarburisation of silicon steel strip is rated at 620 kW, has a maximum operating temperature of 950° C and processes strip at about one ton an hour.

The use of infra-red heating for drying wood finishes has been applied to furniture, radio cabinets and veneered panels. In an installation at Saro Laminated Wood Products Ltd., panels are sprayed with synthetic resin material and after 5-7 minutes' stoving a durable fire-resistant plastic coating is produced. A similar plant at Jaguar Cars Ltd., Coventry, is used for force-drying the cellulose base finish applied to the interior woodwork of cars. Drying time is cut from 12 hours to nine minutes. The weekly output is sufficient for 300 complete sets of car woodwork.

Testing Fluorescent Fittings

Problems of Specification Summarised in I.E.S. Paper

PROBLEMS that arise in preparing a specification for mains voltage fluorescent lamps occupied the attention of the Illuminating Engineering Society at its London meeting on Tuesday. The authors of the paper presented were Messrs. G. FAHEY, B.SC., D.F.H., M.I.E.S., D. T. WAIGH, B.SC., A.INST.P., M.I.E.S., and W. R. BLOXSIDGE, A.M.I.E.E., M.I.E.S. (Thorn Electrical Industries Ltd.), and they began their discussion with a consideration of the lamp proper. Here, there are five important characteristics to be watched, and the table lists the external factors which affect them.

It is emphasised in the paper that differences up to 50 V in striking volts may be found between the same lamp with and without an adjacent earthed conductor, and such an earth is specially required where transformer start is used and with certain types of glow switch. With such lamps surface resistance also has a marked effect, and atmospheric r.h. if high may reduce this. Lamp life may be seriously affected by the frequency of switching on and off; reduction of the running period between starts from three hours to one may reduce life by 50%. For reproducible results in tests, it is also necessary to specify adequate cathode pre-heating.

Striking volts tests should be made with unused lamps, as an improvement may occur after a period of running. Efficiency measurements require a draught-free enclosure with temperature control, and the organisation of a standard and sub-standard lamp system. With increasing lamp life, "average through life" efficiency figures are difficult to obtain and it is suggested that the 100-hour value will have to suffice. Colour rendering is considered as specially difficult of specification.

Control Gear

Except for the determination of noise, it is considered desirable to test chokes without a lamp in circuit. Temperature restriction is necessary, but there will be a different limit for each design of choke. It is suggested that manufacturers should state the temperature rise and maximum ambient temperature at which the choke will safely operate continuously. All chokes should be designed so that they can withstand fault conditions in the circuit continuously. As a general principle, loss in the choke should not exceed 25% of the appropriate lamp rating. Noise tests should be by aural comparison in a quiet room with a calibrated choke.

Starter Switches

Specifications for thermal starter switches should cover pre-heat time, no-blink current and re-set time. Limits practicable for an 80W lamp are suggested as 1 to 3 seconds, 15 seconds and 60% of nominal lamp current. For glow switches striking time on no-blink current and extinction are the important factors. A 10-second upper limit for striking time is satisfactory, and a leading circuit should be used. Starting transformers, it is recommended, should be subjected to type tests for satisfactory starting with a variety of lamps in circuit under all possible conditions.

After some brief notes on the specification and testing of the fitting the authors conclude with consideration of the performance of the luminaire, as they choose to call the complete assemblage. Thermal tests are made with the top choke tap in use and the circuit voltage 6% above nominal for such a connection. A 20-hour run is made with a similar series of tests under fault conditions following.

FACTORS AFFECTING LAMP PERFORMANCE

External variable factor	Lamp characteristics affected by external variable factors				
	Striking Volts	Running V per W	Efficiency	Colour	Life
Adjacent earth	Yes	No	No	No	No
Humidity	Yes	No	No	No	No
Number of starts ...	No	No	No	No	Yes
Ambient temperature ...	Yes	Yes	Yes	Yes	Yes
Starter transformer ...	Yes	Yes	No	No	Yes
Starter switch	Yes	No	No	No	Yes
Ballast	Yes	Yes	Yes	Yes	Yes

(For simplicity, where the effect is slight, the answer is given as No.)

E.R.A. Report Features Finance

Notes on a Year of Research

FINANCE has the leading place in the Electrical Research Association's annual report for the twelve months ended September 30, 1951. New D.S.I.R. conditions of grant make it necessary to increase income from members if the Association's activities are to be maintained, and plans for the Leatherhead laboratories, which have at last been formalised, require a special subscription for their fulfilment. This preoccupation with money, however, argues no relaxation in the space the report gives to research, and a start is made with some notes on organisation.

The reorganisation of Section A to deal with all specific insulating materials other than oils, was substantially completed during the period under review, and a new sub-committee (G/H) was formed to control the study of flameproof motors. New panels have been organised to guide work on high temperature alloys for turbine plant and to co-ordinate co-operation with the B.E.A. and area boards on work dealing with surge phenomena. Work in the technical liaison and information sections of the Association was extended by the appointment of a technical liaison officer to organise this work on a separate basis.

Dielectrics and Switches

A large proportion of the Association's work was once more performed on insulation and dielectrics. Long term work continued at the University of Bristol on the titanate dielectrics and other ferro-electric substances, while other investigations were extended to Perivale. At the N.P.L. study of the liquid silicones was continued. At Liverpool University work in this field was directed towards theories of intrinsic electric strength.

Work at Perivale on Australian mica showed that its electric strength did not differ materially from the Indian variety. A technique was developed, as a result of other researches, which showed up imperfections in the semi-conducting glaze of large high-tension insulators. In addition to all this general work, there were many investigations into specific insulating materials.

Fundamental research also continued into arcing phenomena in connection with circuit-breaker operation. Special attention has been given to factors affecting the accuracy of recording restriking voltage distribution across series breaks. Related work on circuit characteristics has been applied in particular to British 66 kV and 132 kV systems. In the lower voltage range the effect of circuit constants on fuse operation has attracted attention, while a new contactor-testing laboratory has been organised.

Steam and Wind

At Imperial College, work for the Association into high pressure steam has continued. Electrical heating is being used in a Nimonic 80 boiler to give steam for the work. A 60 lb/hr, 15,000 lb/sq in. reciprocating boiler feed pump is to be used, and only shortage of Nimonic tubing has delayed the work.

A general investigation into the high-temperature strength of carbon steels was completed during the year, and new tests have been commenced on components intended for power stations with operating temperatures up to 1,100°F. Corrosion-resisting ferritic steels are being creep tested in the temperature range 1,160-1,250°F, in the hope of obtaining information that will lead to the development of more economical steels.

Laboratory and field tests confirmed most of the initial assumptions concerning the availability of wind energy for electricity generation. Measurements were extended during the year to the west and south-west coasts of Ireland. By September 1951, more than 50 potential sites had been investigated. Design and costing studies made under the sponsorship of the Ministry of Fuel and Power gave information on the type of aerogenerator likely to be the most economic in practice, and the possibility of building a prototype was discussed.

Transmissions

There were many detailed studies of underground cable phenomena, while in the case of overhead lines work has been carried out on the impedance of steel wires and on clamps for s.c.a. conductors, amongst other matters. In the field of h.v. d.c. transmission the principal development was the recommendation by the committee concerned that a large scale field experiment should be carried out.

Problems of protection on rural networks,

in particular with reference to surges, have been the subject of further investigations. Collection of statistical information on lighting has also been continued.

Transformer investigations included checks on short-circuit stresses, and on thermal problems. Plans were drawn up for the restarting of research into transformer noise.

Progress was made with the preparation of a code of practice on earthing, and a considerable amount of investigation was carried out into the measurement of earth continuity in conduit systems. Field testing was continued on portable equipment for detecting moisture in installed insulation and on another for detecting discharges in insulation.

In rural electrification activities, the major investigations on hay drying and on grain drying were concluded, as was the first phase of work on an electrically driven tractor. At Shinfield, two glasshouses were in use to check the combined effect of soil warming and space heating. In the domestic field, floor heating was investigated and a new programme of research drawn up to find more compact means of thermal storage.

NEW LITERATURE

Electric Illumination

by John O. Kraehenbuehl

A SECOND edition seldom needs much recommendation—the mere fact that that stage in publication has been reached usually indicates the value of a book to a reasonably accurate degree of certainty. Such is the progress of research and development in illuminating engineering that any book dealing with other than the basic principles of lighting is liable to become an historical relic within quite a short space of time. Thus the above-named volume, which comes to us from the U.S. and which first appeared in 1941 presenting the principles underlying the specification and design of electrical lighting for commercial and industrial buildings, has been re-edited and brought up to date.

The latest edition incorporates the changes and developments that have taken place in the intervening years. Additional information contained therein includes calculations and more material on glare, description and computations of louverall systems, and a revision of material on the economics of light production. Prepared essentially for architects and architectural engineers and for a first course in electrical engineering curricula, there are also added appendices expanding the mathematical aspect of the subject. Published by Chapman and Hall Ltd., 446 pages, 9 in. by 6 in. Price 64s.

Gas Discharge Lamps

by J. Funke and P. J. Oranje

SO wide are the present day applications of discharge lighting that there is an assured audience in every branch of electrical engineering for a straightforward text on its principles and application. The present volume is just that. Issued as one of a series of Philips Technical Library volumes on light and lighting, it takes all its examples from the firm's products, but this does not interfere seriously with the generality of the treatment presented. In the first three chapters of the book the principles applying to all discharge lamps are set out, and then follow chapters giving separate attention to sodium, mercury vapour and tubular fluorescent and to beacons, stroboscopes and flash tubes. In each case principles of installation and operation are explained and discussed, and luminous characteristics and colour properties dealt with. This volume should be welcomed as a reference manual by all who wish to learn about electric lighting. Published by Cleaver-Hume Press for Philips Electric Ltd., 288 pages, 9¼ in. x 6 in. Price 30s.

Electroplating and the Engineer

by A. Whittaker

IN this little volume the author presents briefly, for the purpose of the engineer who wishes to be familiar with the general ideas involved, a survey of the commoner forms of electroplating. After a short consideration of materials to be plated, the various cleaning processes involved are discussed. Plating technique for the commoner deposits are then described with particular attention to current densities, solution strengths and operating temperatures. Notes on finishing processes and electrolytic polishing conclude this handy production. Published by Emmott and Co., 87 pages, 7 in. x 4¾ in. Price 4s.

BOOKS RECEIVED

Tables of Factorial numbers and of $\Gamma(n + \frac{1}{2})$ for the First Thousand Values of n!, by E. Salzer. Published by the U.S. National Bureau of Standards, and obtainable from the Government Printing Office, Washington 25, D.C., U.S.A. Price 20 cents, including postage.

Electrical Instruments and Measurements, by W. Alexander. Textbook for technicians and contractors. Published by Cleaver Hume Press, 352 pages, 7¼ in. x 5 in. Price 12s. 6d.

Welding Practice: Vol. I—Welding Metals and Tests, ed. by E. Fuchs and H. Bradley. First part of a three-volume reference work compiled by past and present members of the I.C.I. welding panel. Published by Butterworth's Scientific Publications, Ltd., 130 pages, 9¼ in. by 7 in. Price 17s. 6d.

THREE I.E.E. HONOURS

Annual Awards Announced

AT their meeting last Thursday, the Council of the Institution of Electrical Engineers elected to honorary membership **Sir Arthur P. M. Fleming,** C.B.E., D.ENG., and **Sir Edward Appleton,** K.C.B., G.B.E., M.A., D.SC., LL.D., F.R.S. The council also made the thirtieth award of the Faraday Medal to **Prof. E. O. Lawrence,** A.M., PH.D., for his distinguished work in the field of nuclear physics.

Sir Arthur Fleming

The award to Sir Arthur Fleming is in recognition of his distinguished work in electrical engineering, in particular in the field of technical education; his contributions to scientific research, and his services to the Institution. Born in 1881 and educated at Finsbury Technical College, Sir Arthur completed his technical training with the London Electric Supply Corporation, Ltd., and Elliott Bros. He joined the British Westinghouse Co. (now the Metropolitan-Vickers Electrical Co.) in 1900, and was selected by George Westinghouse as one of the "Holy Forty" for training at Pittsburgh, and on his return he set up an insulation testing section. That was the beginning of the firm's research department which today covers an area of 136,000 sq. ft. and has a staff of over 600. Under Sir Arthur's guidance, the work of the Research Dept. has had very important results, examples of which are the development of a technique for high-vacuum high-voltage equipments and demountable large power thermionic valves which played an important part in making the first radar possible.

He was also a pioneer of broadcasting in this country, for it was from the station 2ZY set up by him at Trafford Park Works that the first wireless programme in the north was transmitted. It was in 1908 that he took over the supervision of the firm's apprentice training, since when, the scheme has rapidly expanded and improved, and its system has been universally adopted. Sir Arthur's work has not been confined to M.V.; his knowledge and experience have been placed at the disposal of numerous societies, government departments and universities, and many have honoured him for his researches. His work on submarine detectors during the 1914-18 war was recognised by the award of the C.B.E., and the honour of knighthood was conferred on him in 1945 for his services to education.

Sir Edward Appleton's honorary membership award is for his distinguished work in the field of pure and applied physics and his researches into the characteristics of the ionosphere and the part they play in determining the mode of propagation of radio waves. Sir Edward Appleton was born in 1892 and educated at Hanson School, Bradford, and St. John's College, Cambridge, where he was Scholar and Exhibitioner and took the Natural Science Tripos in Physics. After serving in the 1914-18 war he returned to Cambridge as assistant demonstrator in experimental physics at the Cavendish Laboratory. From 1924 to 1936 he was Wheatstone professor of Physics at the University of London.

Sir Edward Appleton

About that time he conducted early researches into the propagation of radio waves, particularly on their reflection and refraction, which has proved of fundamental importance in the development of radio location. From 1936 to 1939 he was Jacksonian professor of Natural Philosophy at Cambridge, after which he was for ten years secretary of the Department of Scientific and Industrial Research; he is now Professor and Vice-chancellor of the University of Edinburgh. While secretary of the D.S.I.R., the inspiration and guidance he gave in many fields of national activity were major factors in the success of the scientific effort of this country.

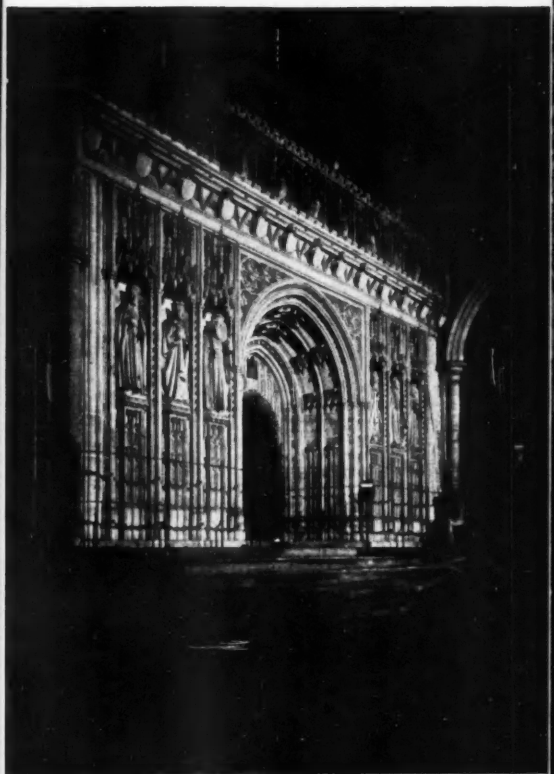
Faraday Medallist

Professor E. O. Lawrence, who has been awarded the Faraday Medal, is director of the Radiation Laboratory in the University of California. His early researches were concerned with photo-electric effects and in 1930 he became interested in the possibilities of using the method of resonance acceleration in order to obtain positive ions at very high energies by means of a number of consecutive accelerations through relatively low differences of potential. His recognition, however, of the limitations of this method of linear resonance acceleration led him to conceive and build the first cyclotron which he used to study the transmutation of elements and artificial radio activity. For this work he gained the Nobel Prize for Physics in 1939.

During the last war he was a member of the team of American and British scientists concerned with the development of fissile materials. In subsequent developments he employed the "Calutron" mass separator to investigate the large-scale separation of uranium isotopes by electromagnetic methods, a system which was later adopted in preference to two other methods.

14 FEBRUARY, 1952

Canterbury Cathedral



Drake and Gorham, contractors, recently published a book showing work they have undertaken at Canterbury Cathedral

Our illustrations are reproduced from the actual photographs in the book and are fine examples both of the book produced and the installations carried out by the company

Top left: the fine work on the 14th century Rood Screen is illuminated by six 200 W lamps enclosed in two special bronze floodlight fittings. Top right: the roof of the Chapter House is made from Irish bog oak. It is lit by 500 W indirect light fittings. Bottom left: the interior of the Eastern Crypt is illuminated by thirty-four 150 W indirect reflector fittings mounted on the capitals of the pillars. Bottom right: the flower vases on each side of the Nave Altar are illuminated by four 150 W lamps enclosed in two bronze fittings

overseas news

Keeping Costs Down

In the past four years, the Electricity Trust of South Australia had made savings now worth at least £659,000 a year in its efforts to keep electricity charges down, the general manager of the Trust, Mr. R. H. M. Lea, stated recently, when commenting on the increased prices to consumers which have just come into operation. And he pointed out that electricity charges in Adelaide had not risen as much as in Sydney, the only other Australian capital where comparative figures were at present available. Since March, 1946, Adelaide's prices had increased 82%, while for Sydney the figure was 150% over the same period.

Atomic Electric Power

In Canada the stage is being set in high-level discussions for the partnership of Canada's atomic energy project and the Hydro-Electric Power Commission of Ontario to see if atomic energy can be used commercially for the production of power, according to reports. It has been suggested, apparently, that Canada's Chalk River atomic scientists should team up with the technical knowledge and resources of the H.E.P.C.

Manitoba's Programme

A tentative schedule of power developments needed in Manitoba was given recently by Mr. D. M. Stephens, chairman of the Manitoba Hydro Electric Board, when addressing a meeting of the Canadian Construction Association. The schedule comprised: (a) completion of the Pine Falls and Seven Sisters projects—both of which will be finished within a few months; (b) development of the McArthur Falls site on the Winnipeg River where 50,000 to 60,000 h.p. can be installed; (c) additions to steam generating capacity—probably by construction of a large station in the vicinity of Brandon; (d) importation of power, on an interim basis, from the Province of Ontario (it is possible this arrangement would precede the Brandon steam station), and (e) utilising hydro power resources on the province's northern rivers —the Nelson, Saskatchewan and Churchill.

Adequate Wiring

Adequate residential wiring and its relationship to the over-all public relations programme of the Canadian electrical industry was the subject of a paper delivered by Mr. D. S. Catton, manager of the Canadian Adequate Wiring Bureau at a recent meeting of the Sales Division (Eastern Zone) of the Canadian Electrical Association at Montreal. Aimed at raising the standards of house wiring, and thus improving the efficiency and economy of operating electrical appliances in the home, the programme of the Bureau will facilitate the establishment of Electric Service Leagues throughout Canada. British Columbia, Manitoba and Ontario are already operating these Leagues. As the first and perhaps the most important step in the national undertaking, Mr. Catton saw the need to establish a national standard of adequacy. "The Standard will serve as the foundation for their national programme and out of it will grow publicity, local support for the undertaking and ultimate achievements," he said.

Opposition to Swiss Schemes

The action of the Swiss Federal Government in granting a concession for the construction of a large hydro-electric power station at Rheinau, on the left bank of the Rhine, has drawn considerable protests from many organisations. The Government has stated that it cannot withdraw the concession, which results from a Swiss-German agreement concluded many years ago, but the Swiss League for the Protection of Nature bases its opposition on the argument that the plant would completely spoil the picturesque locality and that there is a legal possibility of cancelling the concession. Somewhat similar opposition has arisen at Zernez, in the Engadine, where representatives of the 10 communes affected by proposals to build a hydro-electric plant in the Swiss National Park have raised strong objections on the ground that it will divert 400 million cubic metres of water from the Inn and Spoel rivers to Italy, and that the Engadine is the natural basin of these waters.

Belgium's T.V.

The Belgian Government's Television Commission has now reached a decision on transmission definitions. Two separate Belgian programmes will be broadcast, one in Flemish, using a definition of 625 lines and one in French using 819 lines. Flemish and French speaking viewers will thus be able to receive transmissions from Holland or France respectively. Bandspread will be of 7 Mc/s, with positive modulation for vision, and amplitude modulation for sound. The news has been received with satisfaction, both by the public and by the radio manufacturers. No date for the commencement of transmissions has yet been fixed.

Railway Electrification

Negotiations between the New Zealand Government and British Insulated Callenders Construction Co. on the question of electrifying the North Island Main Trunk railway had been going on for some time, but no agreement of any

kind has been reached. This information was given recently in a reply by the Minister of Railways (the Hon. W. S. Goosman) to a question in the closing stages of the last Parliamentary session. The Government recognised the need for the complete reorganisation and improvement of the transport system of Auckland City and the surrounding districts, stated Mr. Goosman. The question of electrification of the Auckland-Frankton section was inextricably bound up with the provision of an electrified circular railway system for the city and its suburbs, and consequently the Government would not and could not be expected to proceed with the former until the scheme for the latter had been prepared and approved. He had set up a special committee to study and make recommendations with regard to the central circular electric system, and the Government's decision would necessarily depend upon a practicable overall plan being evolved.

It was later announced that the Government is appointing a railways Royal Commission, one of whose tasks will probably be to determine priority for the most urgent development work, including electrification.

Japan's Plan

Two new hydro-electric stations constructed in Gumma Prefecture, Japan, have recently been put into commercial operation. The stations have been built by the Tokyo Electric Power Generation Co. as part of its five-year construction programme. That concern has also begun the erection of a 250 kV main transmission line to serve the capital. The two plants are expected to produce an annual maximum of 166,240,000 kWh. But these two stations are only a small part of the main programme. During 1951 work was continued on 21 other hydro-electric and thermal power stations already begun and a start made on 18 hydro-electric plants.

Siam's Scheme

Although Thailand has not developed industrially to any great extent in recent years, the electricity supply problem has become acute, particularly in the larger towns. With good foresight two 8,750 kW generators were ordered from the United Kingdom some time ago, and it is expected that another set, of 7,000 kW capacity, should arrive from Japan within the next eight months, for installation at the Bangkok power station. Plans have also been drawn up for the supply under E.C.A. auspices of five 1,000 kW diesel generators for delivery in the near future. These last are to be installed in small auxiliary power stations now working at Phra Khanong, Bangkolaum and Thonburi. According to reports, all three power stations should be ready to receive their installations early this year. As a further part of the plan to solve the power problem, the Government has accepted recommendations by the World Bank that a hydro-electric power station should be incorporated into the Chainad Dam project. This long term scheme will entail the installation of eight turbine generators, it is stated.

Another Mica Product

A new method of producing mica insulators which, it is believed may make the U.S. independent of foreign mica supplies, has been developed by the chemical division of the General Electric of America, it is reported. In this new process domestic mica is pulverised and the impurities removed. The microscopic flakes are then subjected to a special treatment which forms them into a continuous sheet. This sheet can be produced in thicknesses ranging from 0·002 to 0·006 inch. Called "Micamat," this material is claimed to have better dielectric properties than natural mica products, due to the greater uniformity of thickness and the absence of holes. It can be impregnated with resins and bonded to glass, paper and cloth. Production on a commercial scale is planned for early this year, the report adds. It may be recalled that we have already reported (January 11, 1951 and January 19, 1950 issues) other research work carried out by the U.S. Bureau of Standards in the successful evolution of synthetic mica.

Copper Ban

With effect from February 15, the U.S. Government has banned the use of copper in parts of household and certain types of electric lighting fixtures, excluding the current carrying parts of the apparatus. Excluded from the ban are airport, aircraft, marine, train and vehicular fixtures, and also portable lamps. Earlier this month it was reported that the U.S. National Production Authority had estimated that the total United States demand for copper in the first quarter of 1952 was 160% of supply.

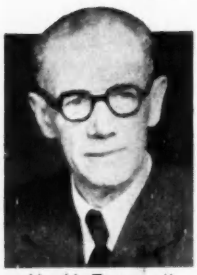
W.I. Expansion

Agreement has been reached between the San Fernando Borough Council and the Trinidad and Tobago Electricity Commission for the supply of electrical energy to the Corporation, Councillor Eric C. Crawford, Mayor, has announced. The plan, which calls for reinforcement of the Corporation's distribution system and other arrangements necessary for bringing auxilliary power to the San Fernando power station will start early this year. The Council is to purchase 600 kW from the Commission daily in order to conserve the life of its overworked engines and to provide a standby in case of emergency. At present all engines at the station are constantly at work and there is no standby. The decision to purchase energy from the Commission was taken by the Council some time ago, because of the difficulty of obtaining spare parts for the existing plant, and with no possibility of increasing the station's output.

PERSONALITIES

IN THE INDUSTRY

Previously station superintendent at Greenhill generating station, Oldham, North Western Division of the B.E.A., **Mr. H. Tattersall** has been appointed to a similar post at the Division's Radcliffe power station. Before going to Greenhill early last year, Mr. Tattersall served at Kearsley power station for many years. He received technical education at the College of Technology, Manchester, and after war service joined the British Thomson-Houston Co. Ltd. in 1919, with whom he was engaged in electrical construction work in generation and distribution stations, etc. He left B.T.H. in 1929 to enter the electricity supply industry as a charge engineer at the Lancashire Electric Power Co's Kearsley power station. At Radcliffe generating station, Mr. Tattersall succeeds **Mr. G. E. Thompson** who retired at the end of last month.



Mr. H. Tattersall

The Bryterlite Electrical Co. (Belfast) Ltd., announce the appointment of **Mr. J. Ballentine,** as general and sales manager, **Mr. C. O. Innis** having resigned his connection with the company.

An interesting ceremony took place at the works of Siemens Brothers and Co. Ltd. recently, when **Mr. F. G. Goodall,** the officer with the longest continuous service with the company's sea-going radio staff, was presented with a certificate commemorating his thirty years' sea service. The ceremony took place in the work's library at Woolwich, beneath the painting of the firm's cable ship *Faraday*, which was sunk by an enemy aircraft in 1941. Mr. S. W. Lumb, F.A.C.C.A., the company's secretary, who made the presentation, afterwards took the chair at lunch. Those present were: **Mr. H. O'Neill** and **Mr. J. A. Cornner** of the Radio Officers' Union; **Mr. W. E. Goodwin, Mr. W. Legg, Mr. H. J. Bird** and **Captain H. Treby Heale,** O.B.E., R.D., R.N.R. (late cable ship *Faraday*), of Siemens Brothers. Mr. Goodall joined the firm in 1919 and has over 32 years' service to his credit. For the last ten years he has been senior radio officer on ships of the Royal Mail Line, and is at present serving in that capacity in the *Highland Princess*. He was senior radio officer in the *Highland Patriot* when she was torpedoed and sunk early in the second world war.

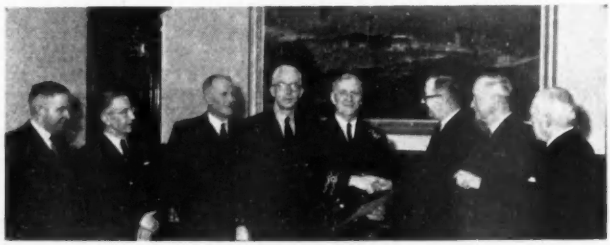
Sir Charles Colston, C.B.E., M.C., D.C.M., chairman and managing director of Hoover Ltd., sailed in the *Queen Elizabeth* on Tuesday last for a few weeks' business visit to the United States.

Mr. L. B. Smith has been appointed manager of the Building Division of Chamberlain Industries Ltd. He has been with the company since 1934, and has had considerable experience with large-scale building contracts.

Mr. R. Dean Roberts has been appointed director of personnel for the David Brown group of companies. Formerly with the Ford organisation, he was personnel manager at the Dagenham plant, where he also acted as assistant to the manager of the Ford Labour Relations Division.

Two members of the staff of the radio research station of the Department of Scientific and Industrial Research are flying to Africa to record the effects of the total eclipse of the sun on February 25 on the ionosphere. **Mr. W. R. Piggott** left for Nigeria earlier this week and **Mr. C. M. Minnis** goes to Khartoum next week.

At present manager of the Brighton and Hove district of the South Eastern Electricity Board, **Mr. E. H. Skinner,** M.I.E.E., has been promoted to deputy engineer-in-chief to the Board, in succession to Mr. W. E. Gibbs, who is now the engineer-in-chief, as we have already reported. Mr. Skinner, who starts his new duties on April 1, is a Londoner, and received his technical education at Regent Street "Poly." He entered the electricity supply industry when he joined the staff of the metropolitan borough of Stepney undertaking, and later served for many years at Colchester, where he ultimately held the post of deputy borough electrical engineer. In 1944 he became city electrical engineer and manager at Chichester, holding that post till vesting day when he was appointed district executive officer for Portsmouth and Fareham to the Southern Electricity Board. He



The presentation at Siemens Brothers' works

started with the South Eastern Board in October 1948 with the Central Sussex district, and on the amalgamation in November 1949 of the former Brighton and Hove areas of supply, became the first manager of the new district, which is the biggest in Seeboard's area.

We hear that **Mr. W. Brown** has resigned his position as a director with the Metropolitan Electric Cable and Construction Co., Ltd. He was a founder of that concern and held the position of managing director since its inception. During that time he took a great interest in the design and development of mining type cables and also developed special h.t. cables for rural electrification work. Mr. Brown has now joined the board of Siemens-Schuckert (Gt. Britain) Ltd., at Faraday Works, Great West Road, Brentford.

Until recently deputy general works manager of Hoover Ltd., **Mr. B. H. Dyson,** F.I.I.A., M.I.P.E., has been promoted to general works manager for the four main factories of the company. In addition, he is a director of Hoover (Washing Machines) Ltd. After serving an apprenticeship at Letchworth he spent several years in America, returning to England at the end of 1927 and subsequently holding positions in charge of production engineering departments with various organisations. He joined Hoover Ltd. in 1937 and later became production manager at the Perivale factory. During the war he was assistant works manager of the main factory at Perivale and five of the outworking factories. After the war he was promoted to works manager of the Perivale group of factories and, at the beginning of 1951, became deputy works manager of the whole Hoover group.

Mr. B. H. Dyson

Lord Samuel has been elected president of the Parliamentary and Scientific Committee for 1952. The chairman is **Sir Wavell Wakefield,** M.P., and the vice-chairman **Sir Henry Tizard.** The other officers elected are: deputy chairmen, **Sir Ralph Glyn,** M.P., and **Mr. W. T. Wells,** M.P.; hon. treasurer, **Dr. H. J. T. Ellingham,** of the Royal Institute of Chemistry; honorary secretaries, **Mr. C. I. Orr-Ewing,** M.P., **Mr. A. Albu,** M.P., and **Dr. W. R. Wooldridge.**

The resignation is now formally announced of **Sir Ernest Fisk** from the board of Electric and Musical Industries Ltd., as from December 31 last, and from all other directorships and offices held by him in companies of the group.

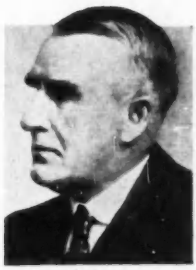
The Hon. A. C. Geddes, deputy chairman of Brush A.B.O.E., has just returned to this country from a tour of the United States and Canada.

Mrs. E. Heyman, sales manager of Smith's Electric Vehicles Ltd., will be sailing to Canada on February 27 in the *Empress of France* for a business trip to Canada and the United States.

Mr. K. E. Merefield has been appointed a special director of the Superheater Company.

OBITUARY

Mr. George Barnard, M.I.E.E., a well-known figure in Midland electrical circles for many years, died on February 7, aged 89. He retired in January, 1942, after 60 years' service with Callender's Cable and Construction Co. Ltd., with whom he was manager of the Midland District Contract Department and advisory director. Subsequently he was for over two years selling agent for electrical concrete (Vinculum) for Tarmac Ltd. With Callender's his experience of cable contracts at home and abroad was extensive. After working in Bath and in London, he went to Birmingham in June, 1890, to start the first mains network throughout the central part of the city for the then Birmingham Electric Supply Co., of which company the late Sir Tom Callender was one of the founders. Later Mr. Barnard was concerned with many other cabling contracts in the city, notably when the undertaking was under the guidance of Mr. Frank Forrest. He was also associated with the late Sir Tom Callender in putting down some of the early underground mains installations in London from 1883 to 1886, before any company or municipal authorities had obtained powers under the 1882 Electric Lighting Act. Among the many jobs with which he was associated were the laying of cables to Covent Garden Opera House when this was first lighted on the Jablockhoff candle system, and cabling for the first electric lighting system at Buckingham Palace. Later he also carried out contracts in France, Germany and Italy for the company. He also represented the C.M.A. in the C.E.B.'s Central England area.



Mr. G. Barnard

Mr. T. A. M. Roberts, sales director of the Metals Division of Imperial Chemical Industries Ltd., whose death on February 3 we briefly referred to last week, was widely known as the company's representative in almost all the trade associations of the wrought non-ferrous metals industry. He was chairman of the Brass and Copper Tube Association, and had held executive and advisory offices in the Cold Rolled Brass and Copper Association and the High Conductivity Copper Association.

Mr. Gilbert K. Ashton, radio sales representative for the Midlands area for E. K. Cole, Ltd. died on January 20.

ELECTRICAL RESEARCH

Recent E.R.A. Reports Available for General Use

A WIDE diversity of subjects is covered in three recently issued E.R.A. Reports. Of interest to all those concerned in the manufacture of flameproof switchgear is Report G/T259, "Intrinsic Safety of Electrical Circuits in Relation to the Explosion Hazard in Industry, and Relative Ease of Ignition by Weak Sparks of Various Gases and Vapours," by J. A. B. Horsley (price 15s.). This covers only switch and control gear and summarises results gained on intrinsic safety research up to the present date. The papers dealt with are S.M.R.E. papers 104 and 106 and E.R.A. Refs. G/T232, G/T257, and G/T258. The results of the experiments carried out in those papers are examined and compared, and the summary is therefore of principal interest in giving an overall view of the field.

Commenting on the results, the author points out that the findings recorded are a valuable contribution to the technical study of the problem of intrinsic safety, but they do not sufficiently cover the range of inflammable gases and vapours encountered in industry such as to warrant their classification into definite groups.

For practical purposes, it would be convenient to arrange the grouping according to the industry in which the various inflammables constitute the explosion hazard; e.g. mining, petroleum, gas, chemical and allied industries.

It is clear from the experiments with different types of "break-flash" apparatus, that the ascertained values of minimum igniting current vary with the means used to produce the spark, and that the selection of the most suitable device for routine testing must depend upon the electrical characteristics of the circuit under test.

It will also be necessary to decide what margin of safety, above bare inability to ignite the selected representative gas or vapour in each group in a limited number of trials, should be required, and how that margin shall be applied for the purposes of routine testing.

Dielectric Properties

The physical properties of dielectrics, and their behaviour under stress are of vital importance to many sections of the electrical industry. Report L/T250, "The Static and Dynamic Rheological Properties of Dielectrics," by W. Lethersich (price 9s.), continues the work reported in Refs. L/T171 and 212. The substances covered in the tests were ebonite and polymethyl methacrylate and polyethylene. It is shown that creep occurs under constant stress and although the rate of creep diminishes with time it does not become zero, which means that the amount of creep does not reach a terminating value. Thus many dielectric structures are never completely stable. The creep is wholly elastic and may be expressed in terms of two hyperbolic distributions of relaxation times. Each relaxation time corresponds to the uncoiling of a chain and is related to the chain length.

Dielectric Heating

A third Report, Ref. W/T20, "Differential Effects in High-Frequency Dielectric Heating," by A. Morris Thomas (price 6s.), was produced due to some confusion of thought that has arisen in biological work on the selective effect of short-wave therapy, disinfestation and sterilisation of plants, etc. The essential feature of this is the heating of living organisms or parts thereof, to temperatures which produce certain beneficial or, on the contrary, certain lethal effects, without harm to contiguous material.

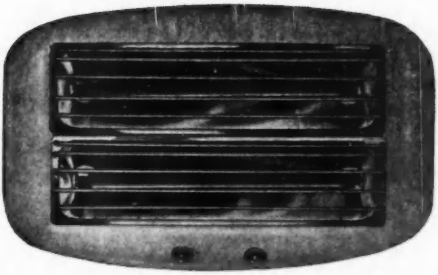
The paths taken by high frequency currents are mainly determined by the permittivities of the material, and these differ much less than the resistivities. A study of the literature dealing with the subject showed that it seemed to be tacitly assumed that the effect of using high frequency would bring about a reversal of any low-frequency differential heating effect. A more serious fallacy was the oft-repeated assertion that "differential heating" effects attained a maximum at a certain frequency or band of frequencies and then declined. Although the existence of maxima in the differential heating/frequency curve is, in fact, possible with certain combinations of materials, generally in biology, such combinations are very rare if not entirely non-existent.

In support of his arguments, the author derives an elementary mathematical theory of dielectric heating and applies it to the two simple cases when (*a*) two substances are disposed in contiguous layers in a plane normal to the applied field, and (*b*) one substance is embedded in another.

The BUYER'S *Column*

Creda's New Two-bar Flatback Fire

BIG sister to the 1 kW Model H828 fire which recently went into production (see ELECTRICAL TIMES, 1st Nov., 1951), SIMPLEX ELECTRIC CO. LTD., Broadwell, Oldbury, Birmingham, have now introduced the 2 kW flat-back fire (Catalogue No. H829). Priced at £4 5s. 6d. plus purchase tax of £3 0s. 8d., this model is suitable for wall mounting in locations where a greater heat is required than could be provided by its smaller sister. With dimensions 11¾ in. by 18½ in. by 4¼ in. the fire is unobtrusive yet neat and efficient in its cream stove enamel finish with aluminium reflector.



This is the Creda H.829 two-bar fire for wall mounting. It has the same neat outline as the H.828

New S.E.S. Steriliser

SURGICAL EQUIPMENT SUPPLIES LTD., of Westfields Road, Acton, London, W.3, have added a newly designed electric hot air steriliser (Cat. No. 3018) to their wide range of equipment. The steriliser has a chamber capacity of 10 in. by 10 in. by 18 in. deep.

A motor-driven fan is fitted which ensures even temperature throughout the chamber—an important feature for pathologists. The steriliser is fitted with three perforated removable trays, making it ideal for the sterilisation of syringes in bulk.

The temperature is thermostatically controlled, with a range from 93° C. to 260° C. A pilot light is incorporated in the circuit to indicate when the steriliser is operating. Two vents are fitted to the top of the instrument for check thermometer readings. The maximum loading of the steriliser is 1,200 watts (the motor, which is of the shaded pole type, uses ½ amp on load); in use, however, the consumption is much reduced through the action of the thermostat.

The steriliser is supplied for bench mounting, or with stand. The standard finish in silver grey enamel, with all bright parts chromium plated.

The D.L. Plus (Red Spot) filling by Scemco

OUR illustrations show the new D.L. Plus (Red Spot) fluorescent fitting which has been recently introduced by SCEMCO LTD., Soho Street, London, W.1.

It is made in two sizes, 5 ft (80 watt) and 4 ft (40 watt), and the plus points from the point of view of the trade are:—

(1) There is a three-colour "clip-in" wiring circuit for the main and starter, so that it is easily visible.

(2) Easy starter lamp access, which the photograph shows, gives access to the fitting by simply removing the end unit.

Price Increases

FURTHER price increases announced in time for inclusion in this issue are listed as under:—

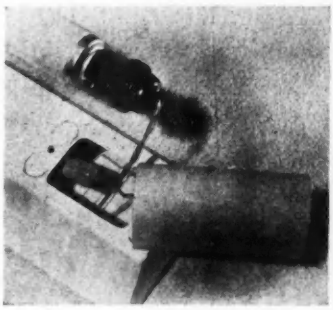
SMITHS ELECTRIC CLOCKS LTD.
"Pinger No. 2" timing device Increases 19s. 6d. to 21s.

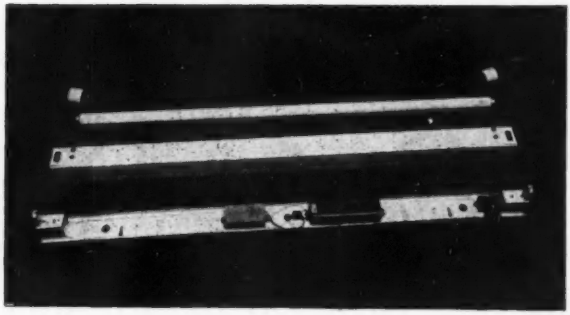
HOTPOINT ELECTRICAL APPLIANCES LTD.
"Plus Five" auto iron ... New price £3 15s. (no tax)
"Laugham" reflector fire £3 2s. 6d....£2 5s. 11d. tax

SUNVIC CONTROLS LTD.
General revision of price list as from February 11.

All increases take effect from as Feb. 1 except as stated.

These photographs show the ease of access to the starter lamp and the exploded view shows the "clip in" wiring circuit fitted in the Scemco DL Plus (Red Spot) fitting





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TRADE PUBLICATIONS

WIRING ACCESSORIES.—A new catalogue and price list issued by George Turnock Ltd., Tunion Works, deals with the comprehensive range of first-class "Tunion" accessories which the firm produce. Among items produced are a large number of American and Continental type accessories which will form a ready market in this country for export commitments and replacements.

NICKEL-ALLOYS.—The current issue of Wiggin Nickel Alloys contains a description of the New Rover lightweight gas turbine in which Nimonic Alloys are employed. This issue, No. 16, may be obtained from Henry Wiggin and Co., Ltd., Wiggin Street, Birmingham 16.

CABLE CLIPS.—List BH30, issued by The Hellerman Electric Ltd., Tinsley Lane, Crawley, Sussex, describes the Hellerman "P" Clips which are so useful for wiring in aircraft, cars and locations where vibration is encountered.

STEEL CASTINGS.—"Buying Steel Castings," latest in a series of bulletins published by the British Steel Founders Association, Broomsgrove Road, Sheffield 10, should prove most interesting to our readers.

Hoover Release New Domestic Polisher

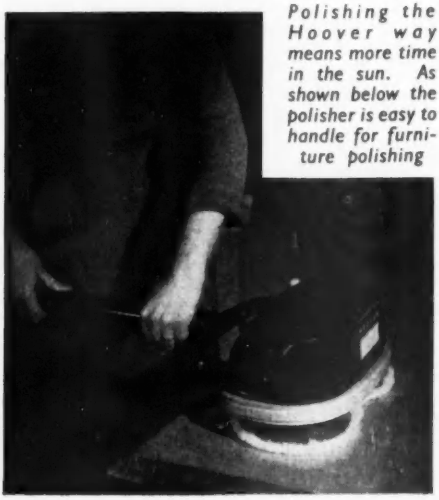
AN introduction long awaited is that of the Hoover domestic floor polisher (see ELECTRICAL TIMES, March 15, 1951) has now been advanced for a variety of prevailing marketing conditions, so that dealers will start receiving supplies as from next week.

The new polisher completes a range of domestic aids marketed by HOOVER LTD., Perivale, Greenford, Middx., which, reasonably priced yet of superlative quality in design and manufacture, help to make the lot of our housewives happy and free from drudgery.

Weighing only 13¾ lb—it is made from aluminium alloy for the main casting and handle, and reinforced plastic for the motor hood—the polisher is easily steered across the floor whilst its two contra-rotating brushes bring up a fine shine in record time. Felt polishing pads and lambswool are supplied for giving even finer degrees of polish on more delicate surfaces.

Apart from the ease of operation, other points which will win the housewife's approval are the low-built front, to enable the polisher to get at awkward, normally inaccessible places without moving heavy furniture; the built-in headlight, an exclusive Hoover feature to point out unpolished spots, and a foot-operated on-off switch to obviate bending backaches.

Guaranteed for one year, the polisher retails through Hoover dealers at £19 19s. (plus £9 14s. 6d. purchase tax). Its rating is 225 watts.



Polishing the Hoover way means more time in the sun. As shown below the polisher is easy to handle for furniture polishing

Electricity in Mining—1950

ONLY four fatal accidents and 56 non-fatal accidents in the mines resulted from electricity in 1950. These figures are given by H.M. Chief Inspector of Mines in his recently published report for that year, and will no doubt be amplified at a later date by the Principal Electrical Inspector. The total number of persons killed was 493, of whom 186 perished as the result of falls of ground.

Once more, one of the fatal accidents draws attention to the need for greater care in regard to flexible cables. In that case the cable was feeding a coalcutter; in three cases of ignition of firedamp and another of outbreak of fire, damaged cables were again to blame, and these latter incidents occurred in safety light pits. The Chief Inspector recommends that where possible, by suitably arranging gate-end boxes, the flexible cable should supply the machine at the front, or haulage, end. Where this is considered impossible, a suitable fairlead should be devised to carry the cable safely over the cutting end of the machine.

Fires involving drill cables on the coal face have drawn attention to the fact that in some designs of gate-end switches adequate overload protection has not always been provided. As a result of discussions with manufacturers some re-design of certain apparatus was undertaken.

Six of the electrical accidents were burns occurring when an accumulation of firedamp was ignited, probably by open-sparking at the non-flameproof switchgear; surprise is expressed that non-flameproof apparatus was used here. Another explosion incident also holds interest for electrical manufacturers, this time indirectly. It involved a drilling machine whose casing was made from an alloy having a high magnesium base. This machine was hanging by a U-bolt when it was unfastened and fell. In falling the machine struck the hard metal base of a coal-conveyor, and a spark occurred which fired the firedamp. It is concluded that such alloys should not be employed for machines which may be so used.

Conveyor Fires

Conveyor fires are the most worrying features noted in the report, amongst them being that which caused the Creswell Colliery disaster. In one case where a solenoid-operated break was fitted to prevent the conveyor running backwards when the current was switched off (gradient 1 : 5), the solenoid had been prevented from lifting and releasing the brake by a small stone. The automatic overload protection was set too high for protection against the consequent fault.

As a final note, in view of remarks made in recent years, it may be stated that of the 64 people injured in all electrical accidents, 31 were electricians, the same as for the years 1948 and 1949. One fatal accident involved an electrician.

S.W. SCOTLAND'S NEW TARIFFS

TWO standard commercial tariffs are to be put into operation as from March 1 by the South West Scotland Electricity Board. The first is a block tariff under which the first 50 units per quarter are at 4d. per unit and all excess at 1·65d. p.u. The alternative is a maximum demand tariff based on the consumer's annual m.d. There is a monthly fixed charge according to the following table, and dependant on the voltage of supply:

kW of annual M.D.	At or over 6 kV	Less than 6 kV
First 200 kW	11/6	12/9
Next 300 kW	10/3	11/3
Next 500 kW	9/-	10/-
Next 1,500 kW	8/-	9/-
All over	7/3	8/-

All units are at 0·45d. per unit for supplies at 6 kV or over and 0·475d. where the voltage is less than 6 kV, plus a variation clause providing for an increase or decrease at the rate of 0·0008d. p.u. for each penny by which the fuel cost per ton to the B.E.A. is more or less than 38s.

Consumers in Glasgow electing to be charged on the block tariff will get their supplies at a reduced secondary rate of 1·4d. per unit, instead of 1·65d., for one year.

These new charges, which replace 47 different tariffs at present in operation in South West Scotland, will increase the revenue from commercial consumers as a whole by about 26%. The effect on individual consumers will, however, vary widely. Of the 72,300 commercial consumers in the area, about 52,300 will pay more while about 20,000 will find their bills reduced.

The tariffs were given unanimous approval at last week's meeting of the area Electricity Consultative Council, when Mr. W. Hutton, deputy chairman of the Board also gave intimation that the Board's domestic and farm tariffs and public lighting charges would also be increased at an early date —probably not later than June. This has become necessary due to the recent rise in the cost of coal and freight and the proposed increase in the Central Authority's bulk supply tariff. Mr. Hutton added that last year the board's operations resulted in a deficit of £100,000, and he thought that for the financial year ending March 31 next the deficit would be even larger, probably about half a million pounds. It was desired to place the board on a firm financial basis, but the full benefits of the increased charges would not be obtained until a later date. Even with the present increase in the commercial and indu trial tariffs they would have to find an additional revenue of £400,000, he added.

THE WEEK

COMMERCE *in news* INDUSTRY

Prospects in Haiti

WE learn that the Haitian Government is shortly to embark on an ambitious five-year plan for the economic, social and agricultural rehabilitation of the country. This rehabilitation undoubtedly offers commercial prospects for all manner of consumer goods, not least among them electrical equipment. U.K. manufacturers will already be well aware of the type of goods likely to find favour in tropical countries, but those who have not established connections in Haiti to date and would like to explore possibilities in this market have been invited to send details of their products to H.M. Consul General at the British Legation, Port-au-Prince. It should be mentioned that there is no exchange control or import licensing system in force in Haiti, and the plan is made more attractive because Haiti is a dollar account country.

TV Conference and Exhibition

TO mark the opening of Kirk O'Shotts television station the Scottish section of the British Institution of Radio Engineers is to hold a conference and exhibition in Glasgow on March 14 and 15. A full programme of papers on numerous aspects of television is being arranged and many manufacturers will be displaying receivers, aerials, test gear and like equipment. Registration fee will be 7s. 6d. Further details may be had from Mr. R. H. Garner, 66 Buchanan Drive, Cambuslang, Lanarkshire.

Another Rise in B.E.A. Borrowings

A STATEMENT of guarantee given by the Treasury just before Christmas was issued last week replacing that given on October 18 last. The guarantee amounts to a sum not exceeding £120 million and is in respect of temporary borrowings by the B.E.A. from the Clearing Banks and Scottish Banks or other persons up to March 31. The previous sum involved was £100 million.

Future of South Bank

THE future of the South Bank site of the Festival of Britain is still under consideration and now that the majority of portable items have been disposed of by auction, there remains the larger equipment and, of course, the site itself. A report on the matter was recently compiled by the South Bank sub-committee of the L.C.C.'s General Purposes Committee and contains a reference to the electricity supply to the site. It has been decided not to retain any of the existing system, which will be removed. The Council's requirements will be far less than those of the Festival, and will be met from the permanent substation in the Royal Festival Hall. Consequential adaptations to the Hall supply are expected to cost about £200. The H.V. supply network and transformer sub-stations were installed by the L.E.B. at the cost of the Festival Authorities, who own it. The experimental heat pump installed by the Ministry of Fuel and Power is to be retained until experience has been gained of its heating powers.

Steel may Cost more Next Week

IT is expected that the Ministry of Supply will announce an increase of £4 to £5 a ton in the maximum controlled prices of steel within the next week. The rise will help to offset the high cost of steel imported from the U.S. and the increased expenditure on scrap, coal, transport and labour. It is doubtful whether the increases will cover all the industry's extra costs. The last rise in price was one of 20% last August.

New Companies during 1951

THE annual summary of new company registrations for the year 1951 has just been issued by Jordan and Sons Ltd., Company Registration Agents, 116 Chancery Lane, W.C.2. Although the analysis is reasonably detailed, the various fields of the electrical industry are listed under the general headings of electricity gas, and water (which includes the radio industry), and engineers. Under the former classification there was a total

The First Half-Century

There is to be a British Exhibition held at St. Petersburg next summer, and the manager and secretary, Mr. J. H. Johnson, has communicated to the *Times* of Monday last a powerful appeal to British firms to take that opportunity of bringing their goods before the Russian public, and of reviving the important, but decaying British trade with Russia. Amongst the goods in demand there are dynamos, motors, electric light fittings, electric lifts, cranes, etc., machine tools, motor cars, bicycles, and many others which our engineers and manufacturers are well able to supply. Every assistance is offered to firms desiring to exhibit, and goods are to be admitted for exhibition duty free; duty being only charged on such as are sold in Russia.—*From our issue of February* 13, 1902.

of 404 companies registered with a capital of £1,439,650, of which three were public companies with a capital of £3,000. A total of 1,276 new companies were registered in the section headed engineers, and these with a capital of £8,881,650. Four of them were public companies. Among 187 companies incorporated in 1951 with initial capitals of £50,000 or over are to be found Lancashire Dynamo and Crypto (Manufacturing) Ltd., Drake and Gorham (Contractors) Ltd., Main Refrigeration Ltd., and Britannia Wire Works Ltd.

Lighting large Engineering Shops

DESPITE the wide area to be lighted and height of the building, a comparatively high level of illumination has been attained at the new factory extension of K and L Steelfounders and Engineers Ltd., in Durham Lane, Letchworth. The recent installation was carried out by the company's own engineering staff and A. E. Ratcliffe Ltd., with equipment supplied by the Edison Swan Electric Co. Ltd. Overlamp dispersive reflectors were used throughout, each housing a 1000-watt lamp. These give an average service intensity of 16 lumens per sq ft at a working height of 3 ft. An idea of the effectiveness of the scheme may be gained from the fact that the photograph reproduced on this page was taken by the unaided light of the installation.

Two Productivity Teams Sail

TWO British specialist teams sailed from Southampton aboard the *Queen Elizabeth* on Tuesday with the tasks of studying design and productivity and plastics moulding in America. They travel under the auspices of the Anglo-American Council on Productivity, and comprise many members directly connected with the electrical industry.

The first comprises eleven members under the joint leadership of Messrs. R. S. Medlock of George Kent Ltd., and M. H. Thomas of the Council of Industrial Design. One of the party's chief aims will be to examine organisations and methods adopted for securing co-operation between research, design, development and engineering departments. Special attention will be paid to simplification of procedures, reduction of scrap and cutting costs. Other members of the team are Messrs. F. E. Butcher (Joseph Lucas (Electrical) Ltd.,) G. W. Hart (Murphy Radio Ltd.), R. A. H. Scanes (Evershed and Vignoles Ltd.), H. Smith and G. A. J. Witton (J. Stone and Co., Ltd.), and J. Holland (Assoc. of Engineering and Shipbuilding Draughtsmen), accompanied by Messrs. G. M. Dunn (Sperry Gyroscope Co., Ltd.), G. Scholes (David Brown Tractors (Engineering) Ltd.), and R. R. Ponton (Rolls-Royce Ltd.).

The team to investigate plastics is rather larger, there being 16 members under the chairmanship of Mr. A. L. Sparshot of G.E.C. Insulation Works. Others in this party are: Messrs. L. F. Honey and E. Patching (Hoover Ltd.), J. R. Tegerdine (E. K. Cole Ltd.), R. Norwood and J. S. Walker (Fraser and Glass Ltd.), F. A. Howlett, E. H. Sharp and J. Barker (British Xylonite Co. Ltd.), J. H. P. White (Cosmocord Ltd.), W. C. Fish (Ashdowns Ltd.), and C. J. G. Stanley (British Plastics Fed.), with Messrs. E. L. Merritt (Evered and Co. Ltd.), H. Beaumont (Derwent Plastics Ltd.), D. Eccles (E.V.B. Plastics Ltd.), and A. Prasser (Plastic Engineers Ltd.).

Courses on Management

A FIVE-DAY study course on Industrial Relations is being organised by the Institute of Personnel Management at the Esplanade Hotel, Porthcawl, between March 9 and 14. It is being designed particularly for those with limited experience of consultation and negotiation. In view of past experience when it has been found that the greatest benefits are derived if attendance is kept low, plans are being laid to accommodate about 20. The Institute is also planning an advanced course on Personnel Management which will be held in London at the Ford Hotel from March 17 to April 4. The aims of this course are to give an appreciation of the approach to problems of human relations, and to stress the need for knowledge of and practice in social skills. As in the first case, the number attending will necessarily be limited to 20. Further details and applications in respect of both courses can be obtained from and sent to the Institute at 8 Hill Street, W.1.

Detailed Gas Turbine Course

THREE detailed and highly specialised courses are to be held this summer by the School of Gas Turbine Technology. Departing from the more usual practice of covering the overall picture of the design of gas turbines, each of the three will take

Factory extension of K and L Steelfounders and Engineers Ltd., Letchworth, illuminated by 72 Royal "Ediswan" gas-filled lamps in overlamp dispersive reflectors

The cleaning of telephone wires on London's Underground by means of power-driven wire brushes which have superseded the old method of cleaning by hand with emery cloth

one component and devote a week to dealing with it in detail. The first course, from June 30 to July 4, will cover the theory and design of compressors; the second, between July 7 and 11, will deal with the combustion and design of heat xchangers, and final week, July 14 to 18, will be levoted to the theory and design of turbines.

Power Station Workers win Awards

TWO employees at Mexborough power station in the Yorkshire Division of B.E.A. have been awarded the Testimonial on Parchment combined with Resuscitation Certificate, and the Resuscitation Certificate, by the Royal Humane Society, following an incident which occurred on August 20 last. The employees are Mr. J. E. Downing, a labourer, and Mr. F. Moxon, a fitter's mate.

On the above date a seven-year-old child fell into the canal near the power station, and Mr. Downing, seeing the accident from the station's boiler house, ran to the scene and dived fully clothed into the canal to rescue the child. Both Mr. Downing and Mr. Moxon applied artificial respiration to the then unconscious lad and succeeded in bringing him round before he was taken to hospital.

Coming-of-Age Conference

FORMED in 1931, the Purchasing Officers' Association is to celebrate its "coming-of-age" at the national conference to be held at Harrogate between October 2 and 5. A feature of the conference will again be the Minibition, which was first held at Brighton in 1950 and successfully repeated at Llandudno last year. Space considerations will not allow the Minibition to be extended beyond last year's limits, an unfortunate restriction in view of the fact that over half of the exhibitors at Llandudno have already made reservations for space. As in previous years, the stands will be of uniform size and of two designs.

Board sells Trolleybuses

THE Llanelly Traction Co.'s undertaking, originally the Llanelly and District Electric Supply Co. Ltd. which operated both petrol-driven and trolley vehicles, has been sold by the S. Wales Electricity Board to the S. Wales Transport Co., Ltd. The undertaking was taken over under the Electricity Act 1947 and has been operated by the Board since vesting day. The deal, officially announced last week, is subject to consent being given by the Ministry of Transport but the transfer is expected to take place within a month. Financial details of the deal have not been disclosed.

Cleaning Wires in London's Tube

POWER-DRIVEN wire brushes have replaced emery cloth in the cleaning of telephone wires along the tunnels of London Transport's underground railway. Two of these brushes have been mounted on parallel shafts about a foot apart and driven by separate electric motors. They form one unit pivoting about the end of a long rod, and to reduce fatigue in the operators, the weight of the motors has been counterbalanced. Two wagons have been equipped in this way and form a short train with a battery locomotive which also supplies power for the motors. The telephone wires are those providing communication with substation or traffic controller for cutting off current or in similar emergencies.

Calculator saves Board £200

THE invention and subsequent operation of a calculating device has saved the South Western Electricity Board about £200 in the past year, said Mr. S. F. Steward, the Board's chairman at a recent presentation of awards for suggestions and long service. The co-inventors whose calculator won first prize were each given £10 under the Board's Suggestions Scheme. They are Mr. R. W. Jenkins and Mr. F. W. G. Robertson, both in the Meter Records section at Bristol.

The handy ready-reckoner which they devised comprises a chart with over 3,000 calculations rotating on a cylinder. This can be stopped

OFFICIAL PUBLICATIONS THIS WEEK

STATEMENT OF GUARANTEE—ELECTRICITY ACT, 1947. (*See page* 316.) H.M.S.O., 2d.

BRITISH STANDARDS

B.S.978 : *Gears for Instruments and Clockwork Mechanisms, Part I : Involute Spur, Helical and Crossed Helical Gears.* B.S.1113 : *British Standard Packaging Code : Section 5, Protection Against Spoilage.* B.S.1332 : *Guide to Civil Land Aerodrome Lighting.* B.S.1806: *Dimensions of Toroidal Sealing Rings.* B.S.1807 : *Gears for Turbines and Similar Drives, Part I, Accuracy.* B.S.1813 : *Dimensions of Conduit Dies.*

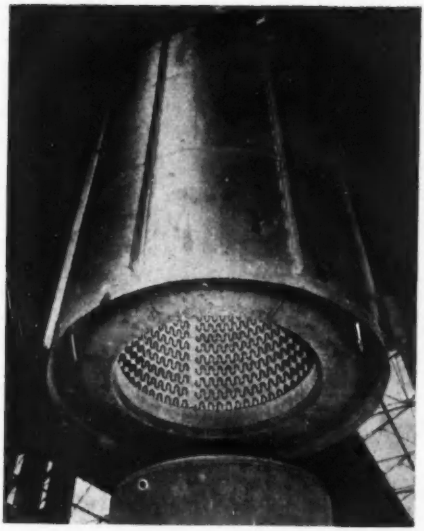
against a fixed scale, pin-pointing the required figure quickly and accurately. One of the most valuable uses has been found to be in the calculation of part-quarter charges for hired appliances. Long-service awards were made to seven employees who had completed between 44 and 27 years' service in the supply industry. Gifts included cheques, a fireside chair, electric blanket and small vacuum cleaner.

Heat Treatment of Steel Coils

SIX vertical cylindrical bell furnaces were recently supplied by the G.E.C. to the Brierley Hill works of Richard Thomas and Baldwins Ltd. The furnaces each weigh 15 tons and are capable of annealing up to 700 tons of coiled silicon steel strip a week. The steel is mounted in stacks of coils some 8 ft high and these are sealed under a heat-resisting steel hood of lightweight construction. The hood in turn is then enclosed in the furnace bell, which carries the heating elements made from Nichrome strip and wound in sinuous form. Each furnace is rated at 360 kW and has its elements arranged in two 3-phase circuits. Heat treatment is carried out at a temperature of between 740° C and 780° C in an atmosphere of cracked and burnt ammonia which is circulated through the charge by a fan unit housed in the centre of the furnace base, and passes between plates separating the coils before returning through the centre.

£103 for Charities

VISITORS who have lunched at the works of Dewrance and Co. Ltd. and made donations to the ever-present Charity Box there will no doubt be interested to learn that their gifts totalled the record sum of £103 7s. 9½d. As is customary, this amount has been distributed among various local charities, including Guy's Hospital and the Royal Eye Hospital. The winner of the prize for the closest guess was Mr. H. B. Harmsworth of Monsanto Chemicals Ltd.



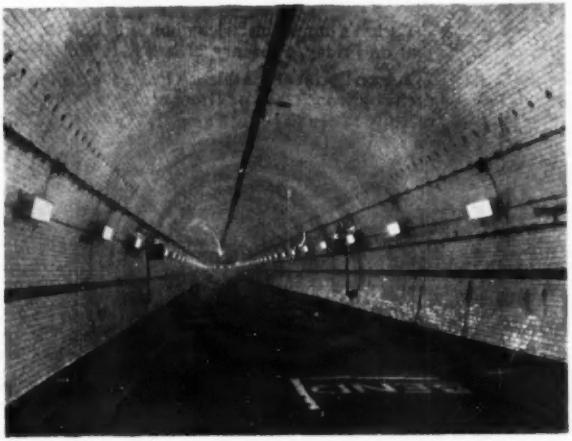
Interior of the bell-type furnace, clearly showing the heating elements

Aim to improve Thermal Efficiency

SPEAKING at the fourth annual dinner of St. Andrews Rd. power station, Mr. G. A. Vowles, Yorkshire Divisional Controller, assured his audience that every effort was being made both by the B.E.A. in general and the Yorkshire Division in particular, to improve thermal efficiency, while avoiding tariff increases. He pointed out that the cost of generation continued to rise—provision of new plant now cost £60/kW compared with £12 pre-war. Much had been done in the field of labour relations, Mr. Vowles said; advisory councils had been formed and workers could express their views and make suggestions through them. Over 50 such suggestions had been received in Yorkshire and two people had been rewarded.

Approach Aid for Small Airstrips

IT is quite frequent that we read during the winter months of the necessity to divert aircraft from one airstrip to another, particularly among the smaller aerodromes.



A view along the Blackwall Tunnel at the Poplar end which was relit a short time ago by the L.C.C. A brief description of the new installation appeared in our January 24 issue. Fittings used were supplied by Courtney, Pope (Electrical) Ltd., the "fused" plug connections to the mains were products of Dorman and Smith Ltd.

Evidence of the penetration of British goods in the more remote parts of the world is substantiated by this stand at the Bangkok Constitution Fair. It belonged to the Thai-British Trading Co. Ltd., agents for the G.E.C. in Thailand, and includes in its display sundry domestic appliances, refrigerators, radios, fans and lamps made by the latter company

This situation may well be a thing of the past, following the development of equipment which is capable of bringing in aircraft in very poor visibility. A demonstration of this new apparatus, made by E. K. Cole Ltd., took place at Southend last week. It is intended for use at 'dromes where the cost of installing and operating the type of equipment used at such places as Heath Row would not be economically justified. The equipment comprises a combination of a 3-cm radar installation with a v.h.f. D.F. receiver. It can be operated on the ground by only one person. Experiments to date have all proved successful in bringing in various types of aircraft, including jets.

Technical Information

THE Discussion Group concerned with the Presentation of Technical Information is to hold its second ordinary meeting of the 1952 session in the Anatomy Theatre of University College, London, on February 21. The paper will be "The Teaching of P.T.I." and is to be read by Mr. B. C. Brookes, lecturer on the subject at the college. It is due to start at 6 p.m.

E.A.W. Birthdays

TWO branches of E.A.W. have celebrated birthdays recently. One of the oldest branches, that established in Cardiff, was the fifth in the Association to reach its 25th anniversary and the occasion was suitably commemorated with a dinner. The Liverpool branch is just four years younger and local members of the Association celebrated their coming of age with a luncheon. At this function incidentally, a special presentation was made to Miss Rita Brown who has been the hon. secretary for the 21 years.

Best Use of Supplies

SHOPKEEPERS' problems of trying to make the best use of the restricted supplies of electricity available for interior lighting, were dealt with by Mr. W. Robinson of E.D.A., in a talk on "Modern Shop and Home Lighting," at Stowmarket last week. He suggested that by installing fluorescent lamps, the shopkeeper was able to surmount some of the difficulties of restriction. Mr. Robinson particularly emphasised the use of the new full-coloured fluorescent lamps as an adjunct to window display lighting.

NEWS IN BRIEF

The 35th Swedish Industries Fair, equivalent to our B.I.F., will take place at Gothenburg from May 17 to 25. In addition to Swedish exhibitors, the Norwegians, Danes and Finns will also be represented. U.K. representatives are John E. Buck and Co., 47 Brewer St., Piccadilly, W.1.

Exhibition of household goods is to be arranged by Gothenburg Merchants' Federation from April 5 to 14 at premises of Gothenburg Fair.

Course of special lectures on "Liquid Fuels, Their Properties and Utilisation" is being offered by the Northampton Polytechnic. It will be delivered by Mr. G. F. J. Murray on Tuesdays beginning February 26. Fee is £1.

Berks, Bucks and Oxon branch of E.I.B.A. are to hold their third annual ball at Olympia Ballroom, Reading, on March 14. Tickets at 12s. 6d. double and 7s. 6d. single, from L. H. Waters, S.E.B., Market Place, Reading.

Birmingham Electric Club's golf competition is to take place at Edgbaston on April 28.

Burton's annual electricity ball is to be held this year on Friday, February 29.

Telcon Social and Athletic Group took 630 children by coach from Greenwich to Wembley recently to see the pantomime "Robinson Crusoe on Ice."

Well over 300 members and guests were at the annual dinner dance of the Worcester Electric Club held recently.

Ideas for using light in the home were suggested by Mr. T. O. Freeth in a talk on "Lighting" at the Lighting Service Bureau, London, last week. His remarks were illustrated by slides.

We hear that Derby County F.C. are proposing to fit electric wires below the pitch at the Baseball ground. The work will be carried out during the summer at one end of the pitch only as an experiment to make the grass grow for a month longer each year.

Questions in Parliament

Peat for Power Stations

Progress on the investigation and experiments into the use of peat as a fuel for power stations were reported on by Mr. Snadden, joint Under-Secretary of State for Scotland, at question time last week. He said John Brown and Co. had completed an experimental peat-fired closed-cycle gas turbine under contract to the H.E. Board and were testing it. An open-cycle turbine would be completed shortly for the Ministry of Fuel and Power by Ruston and Hornsby. Meanwhile the Scottish Peat Committee was making good progress in investigations, paying special attention to the development of more efficient and economical ways of producing and drying peat.

Part-time Members of Boards

It was suggested in the House last week that in view of the need for economy the number of part-time members of the Yorkshire Electricity Board might be reduced, as also their salaries. The questioner also asked whether those members really had any responsibility as to the sums expended in the recent Scarcroft case. Replying, the Minister rejected the first suggestion and concerning responsibility he said it would not be wise to underestimate the weight of responsibilities which part-time members bear in general.

Coal Stocks

Mr. Geoffrey Lloyd gave some facts concerning stocks of coal in an oral answer last week. The industrial position was satisfactory, he said, and broadly, stocks were located in the right places. Total distributed stocks were almost 4½ million tons, higher than at the same time last year, due mainly to a good level of production and also to the fact that a million tons were saved during the warmest November and December ever recorded.

Coal for Export or Electricity?

Asked whether the building programme for additional power stations was being related to the anticipated output of coal in view of the need to increase coal exports, Mr. Lloyd assured the House that the matter was being carefully considered. He added that in emphasising the need for increasing exports, the importance of increasing electricity supplies should not be under-rated.

Private Generators

Mr. Geoffrey Lloyd stated last week that independent generators installed by private firms undoubtedly helped to relieve the demand for electricity, and he was anxious that firms should not be prevented from installing them. Boards had waived the contractual restrictions on the use of those plants until 1959.

E.M.L.A.'s Proposals

The Minister of Supply said he hoped to make a statement shortly on E.L.M.A.'s reply concerning the report of the Monopolies and Restrictive Practices Commission. The Association's proposals were, he said, under consideration.

Steel from the U.S.

Concerning the shipment of steel to this country from the U.S., Mr. Duncan Sandys told the House that during 1952 a total of one million long tons would be purchased. Of this total, some 800,000 long tons would be delivered as steel, mostly in ingots, and 200,000 long tons as scrap and pig iron. In addition America would endeavour to make available a further 750,000 long tons of iron ore.

Only Steel to be Rationed

Mr. Boyd-Carpenter, in a written answer, said no rationing of essential raw materials, other than the scheme introduced for steel allocation, was contemplated.

Rural Electrification in Wales

As might be expected, many Welsh M.P.s spoke during the debate on Welsh Affairs last week, and as far as electricity was concerned the main trend of remarks was the development of rural areas. People were leaving the country for the towns mainly because of the lack of modern amenities among which electricity was prominent—45% of rural dwellings were without electricity, said Mr. G. Roberts. A plea to hasten the advent of electric power to rural Wales was made by Mr. Clement Davies and echoed by Mr. T. W. Jones who stated that N. Wales was very much underdeveloped as regards power supplies although he quickly paid tribute to the Merseyside and N. Wales Board which had done much in the brief period of its existence. He asked that whatever economies the Government envisaged, the progress of rural electrification should not be retarded.

One way of speeding-up this development was suggested by Mr. R. Gower who pointed out that as constituted at present the S.Wales Board had no agricultural member. Re-emphasising this point Mr. R. Bowen, stated that progress in electrification of that area was lower than in any other area of the B.E.A., and gave figures to substantiate his remark. The reason, he suggested, was that the Board had chosen to make their cuts in capital expenditure in that sphere.

Capital for Rural Electrification

The Minister of Fuel and Power was asked whether capital expenditure allocations for electricity in rural areas could be increased to allow for further urgent schemes. Mr. Lloyd stated restrictions in this field were inevitable, but Area Boards had been enabled to proceed with rural electrification schemes already in progress and to start on some of the urgent new schemes.

Forcible Entry

Mr. G. Lloyd stated in a written answer on Monday that there may be grounds for modification in the provisions relating to forcible entry of officers of gas undertakings, which had remained virtually unchanged since 1871. The possibility of bringing these powers into line with more recent legislation was being examined.

Electric Supply News

Croydon

Following complaints during the past six months about grit emission from the new power station at Purley Way and the old power station in Factory Lane, the Town Council has been told that an investigation is to be carried out by the B.E.A. A technician has been appointed specially to supervise the firing of the boilers, but the Authority has pointed out that one of the chief difficulties is the poor quality coal supplied.

Cumberland

The Cumberland county development plan refers to the shortage of electricity in the outlying rural areas and states that the electricity authority intended to deal with this matter by extending the 11 kV supply lines especially in the southern and eastern parts of the area. A 275 kV line is proposed across the northern part which would link Glasgow with Tyneside. The plan states that final agreement has not been reached yet between Northumberland County Council and the B.E.A. on the alignment of the eastern portion of the line.

Dundee

Arrangements for the voltage change-over from 200 to 240 volts are now being carried out in the east end of Dundee, part of the Downfield area, and West Ferry. Most of the western area of the city has already been converted under the two-year plan to bring Dundee into line with the standard voltage for Britain.

Easington (Co. Durham)

The Rural District Council is supporting a protest by Dalton-le-Dale Parish Council against an increase of 10% in electricity charges decided upon by the National Coal Board. The Parish Council is also objecting to the fact that the increase will be paid only by consumers who are not employees of the Coal Board. The Rural Council has also received complaints about the poor quality of the supply at Dalton-le-Dale.

Eire

The Eire Electricity Supply Board is being empowered to spend up to £53,500,000 for electricity development, according to the terms of an Electricity Supply (Amendment) Bill issued in Dublin last week. The present limit of spending is £28,500,000. The money will be used for the erection of power stations and the harnessing of rivers, the erection of additional grid lines and the extension of supplies to farmers.

The E.S.B. has made application to the Dublin Corporation for planning permission to build a block of offices 111 ft high to their present head offices in Dublin. The Planning Committee has recommended that the building should not be higher than 50 to 70 ft.

Falkirk

There has been much discussion between the Town Council and the S.E. Scotland Electricity Board over the question of the cost of laying supply cables to the Langlees housing estate. Originally the Board proposed o.h. lines, but on appeal to the Ministry of Fuel and Power by the Corporation, the Board has agreed to install underground cable, and has asked for a contribution of £636, pointing out that there had been an increase of 18% in the cost of materials required for the works since March, 1951. The Corporation has agreed to accept liability for payment, and the Town Clerk has intimated that as the supply had been asked for in January, 1951, and the materials were no doubt acquired by the Board at that time, he presumed that the costs to be levied would be based on prices ruling at January, 1951.

Newcastle-on-Tyne

A dispute between the City Council and the B.E.A. regarding the handing over to the Authority of £3,461, the balance of the Benwell and Fenham Electric Lighting Order reserve account on March 31, 1948, has ended. The Corporation has agreed to the transfer of the money to the B.E.A. A report by the Transport and Electricity Committee stated under the 1947 Act all investments and cash of electricity undertakings had to be transferred to the B.E.A. The Corporation contended that the balance of the Benwell and Fenham Electric Lighting Order reserve account was part of the general rate fund. The Committee has been informed, however, that in two other disputes similar to that at Newcastle the Minister of Housing and Local Government had adjudicated in favour of the B.E.A. The Committee decided, therefore, that there was no point in following up the matter and recommended the immediate payment of £3,461 to the Authority.

S.E. Scotland

The South East Scotland Electricity Board had had handed to them by the Central Authority the sum of £84,413 from specific reserves, Mr. J. M. Airlie, chairman of the area Consultative Committee, announced at its meeting last week. Mr. Airlie pointed out that the sum represented reserves held by various undertakings for specific purposes prior to vesting date, as distinct from the general reserves of the area of £1,040,000, which were still held by the Central Authority. Of the sum received, £20,000 was to be set aside for bad and doubtful debts, and £22,000 for superannuation liabilities. The balance of £42,413 goes to current revenue account. It was also intimated to the council that the Central Authority had adopted the recommendations of accountants, which aimed at establishing a more equitable method of assessing the rating liabilities of the Area Board. Under the former method the board considered they had to pay a disproportionate amount under this heading, and Mr. Airlie said that last year they had paid under protest the sum asked by the Central Authority when they

received a directive from the latter compelling them to do so. With the adoption of the new method, the board had inquired about a refund, but the Minister had replied that the adoption of the new method was not retrospective.

S.W. Scotland

A scheme estimated to cost £58,000 for supplying electricity to 1,456 houses which are to be erected by Glasgow Corporation in Ruchazie Housing Scheme, Carntyne, has been approved by the S.W. Scotland Electricity Board. The scheme will involve the laying of high and low voltage cables and the construction of three substations.

LIGHTING SCHEMES

Ashton-in-Makerfield.—Application is being made by U.D.C. to borrow £3,107 for the installation of electric lighting on Wigan Road. Total cost of the work will be more than £6,000, towards which the Ministry contribute 50%.

Cockermouth.—U.D.C. to install tungsten lighting on five roads.

Bexley.—T.C. is recommended to approve street lighting improvement schemes for Blendon Road (£1,715), Erith Road (£1,200) and Parkhill Road (£1,655).

Bradford.—The conversion of several roads from gas to electric street lighting, at an estimated cost of £29,000, is recommended by Corporation Finance Estimates Sub-Committee. The scheme is part of a major plan for changing the city's street lighting.

Coventry.—The Road Safety Committee has recommended a revised scheme for relighting nine miles of roads, using 344 lamps, costing £17,888.

Edinburgh.—The Works Committee has approved of the inclusion in the financial estimates of £80,000 for new installations and street lighting, £10,000 for conversions and £1,500 for replacement of time-switches.

Maidenhead.—T.C. is to inform M.o.T. that they are seriously concerned at the long delay in approving a scheme for the lighting of Maidenhead Bridge.

Company Activities

Associated Electrical Industries

It is now stated authoritatively that the International General Electric Co. Inc. (of New York) intends to take up part of the A.E.I. issue of new shares by way of "rights," to which it is entitled. The balance of that company's rights has been placed privately, we understand. The issue, made last month, was of 2,217,649 £1 Ordinary shares at 60s. each to Ordinary stockholders on the basis of one for three.

Automatic Telephone & Electric Co.

Allotment letters were posted last week-end for the issue of 544,000 new Ordinary shares of £1 each at 45s. per share. These are offered to Ordinary and Deferred stockholders in the proportion of two new shares for each £5 of stock held on January 18. A sum of £1 per share is payable by February 22 and the balance is due by April 4. The issue has been underwritten by Telephone and General Trust.

Brazilian Traction Light and Power Co. Ltd.

At the special general meeting in Toronto last week, shareholders sanctioned the increase in capital, and application is being made to the Secretary of State of Canada for the issue of supplementary letters patent.

Electrical and Industrial Investment

For 1951 the net profit is £44,322 (*£39,061*). Taxation absorbs £39,500 (*£36,500*). To Deferred Ordinary dividend 25% (*20%*) added to undivided profits £24,372 (*£20,911*).

Hubert Davies & Co.

The preliminary statement of this well-known South African electrical concern shows a net profit of £345,124 (*£273,668*) for the year to October 31, after charging taxation of £168,273 (*£96,443*), but including special profits on sale of property £21,888 (*nil*) There is a final Ordinary dividend of 20%, making 27½% for the year (*same*). The sum of £20,000 (*£17,798*) is transferred to property and investments reserve and £60,000 (*£30,000*) to general reserve.

Lewis Berger & Sons

A one-for-two scrip bonus is announced by the directors. Permission of the Treasury has been given for the capitalisation of £527,275 representing undivided profits standing to the credit of General Reserve. It is proposed to apply that sum in paying up in full 2,636,375 of the unissued Ordinary shares of 4s., for distribution to Ordinary shareholders registered on February 23 in the proportion of one 4s. share for every 8s. of the Ordinary stock held.

Dividends Declared

Crabtree Electrical Industries.—Interim Ordinary dividend of 7½% (*5%*). The directors state that the decision to pay an increased interim has been made in order to achieve more even distribution between interim and final dividends, and it should not be taken as an indication of their intention to recommend an increased total distribution for the year.

Hoover Ltd.—Final Ordinary dividend is 25%, making 35%. Group net profit is £3,014,894 (*£2,475,271*).

M. Mole and Son.—Dividend of 10% and cash bonus of 10% (compared with dividend of 20% for the previous year). The profit is £17,282 (*£13,985*), after charging taxation of £24,984 (*£15,399*).

Commercial Information

CONTRACTS OPEN

HOME

Feb. 15.—Aberdeen. Electrical work in erection of food warehouse at Greenbank Rd., Tullos, for Kraft Foods, Ltd., Hayes, Middx. Architect is R. Meldrum, 5 E. Craibstone St., Aberdeen.

Feb. 15.—Belfast. Supply and erection of bulldozer with capacity of 120 tons coal per hour, minimum h.p. of 100 for engine, for Victoria power station. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. (See Jan. 17 issue.)

Feb. 15.—Castlebar (Mayo) Electrical installation in County Clinic. E. R. Ryan, consulting engineer, 1 Montpellier Terrace, Galway. Deposit £10 10s.

Feb. 15.—Fife. Electrical work in erection of eight houses at Grange of Lindores. Surveyors are C. R. Douglas and Co., 15 East Port, Dunfermline.

Feb. 15.—Lowestoft T.C. Electrical installation to new laboratory at grammar school in Yarmouth Rd. Borough Engineer's Dept., Town Hall. Deposit £1 1s.

Feb. 15.—Sheffield. Electrical installation in secondary school for girls at Hurlfield. W. Geo. Davies, City Architect, Town Hall. Deposit £2.

Feb. 16.—Edinburgh. Maintenance contracts include electrical services to Western, Northern and Eastern General Hospitals and Musselburgh Maternity Hospital, during year beginning April 1. J. M. Horne, secretary and treasurer to Board of Management, Northern General Hospital, Ferry Rd., Edinburgh.

Feb. 16.—Enfield. Group Hospital Management Committee require supply of electric lamps for year beginning April 20. Supplies Officer, Chase Farm Hospital.

Feb. 16.—Harpenden U.D.C. Erection of 40 reinforced concrete columns with lanterns in Class B. Engineer and Surveyor, Harpenden Hall. Deposit £1 1s.

Feb. 18.—Bradford. Electrical installation in 260 houses and 28 flats on Buttershaw estate. City Engineer and Surveyor, Town Hall. Deposit £2 2s.

Feb. 18.—Bury St. Edmunds T.C. Inspection and maintenance of electrical equipment and installations in houses on Mildenhall Rd. estate. Borough Engineer and Surveyor, Borough Offices, Angel Hill.

Feb. 18.—Gravesend T.C. Rewiring of Municipal Offices and supply of certain electrical equipment. Borough Engineer and Surveyor, 6 Woodville Terrace, Gravesend. Deposit £1 1s. (See Feb. 7 issue.)

Feb. 18.—King's Lynn T.C. Supply of electric lamps for year ending March 31, 1953. Borough Engineer, H. G. Ridler, 27 Queen St.

Feb. 18.—Manchester. Electrical installation at "Barfield" and "Southernhey." West Didsbury. City Architect, Town Hall. Deposit £1 1s. (See Jan. 31 issue.)

Feb. 18.—Stainforth (Yorks). Installation of lighting and power pointing in cemetery chapel. T. Brennan, clerk to Parish Council, 18 Kenneth Ave.

Feb. 19.—East Riding. Supply of electric lamps required. Supplies Officer, County Hall, Beverley.

Feb. 19.—Poole T.C. List of supplies for year ending Mar. 31, 1953, includes electric lamps, cables, fittings, water heaters, control units, street lighting lanterns, concrete columns, electric conduit and wiring accessories. J. R. Barron, Borough Engineer and Surveyor, Municipal Bldgs.

Feb. 20.—Keighley T.C. Supply and erection of 29 reinforced concrete columns with lanterns to Class B lighting standard on Calver Ave. estate. Borough Engineer, College Street.

Feb. 20.—Lutterworth U.D.C. Wiring and installation work in 32 new houses and rewiring of 10 others. Engineer, Council Offices.

Feb. 21.—Aberdeen. Electrical work in construction of special school at Inverurie. Tawse and Allan, architects, 343 Union St.

Feb. 22.—Harrow U.D.C. Supply and installation of 227 140 W sodium lanterns, lamps and control gear in Group A. Council's Engineer, J. H. Melville Richards, Council Offices, Uxbridge Rd., Stanmore. Deposit £2.

Feb. 22.—Sunderland. Electrical installation at St. Cuthberts junior and infants. school, Grindon. Architects, Matkin and Hawkins, Barclays Bank Chambers, Fawcett St. Deposit £1 1s.

Feb. 25.—Bathgate T.C. Installation of fluorescent and sodium lighting along main roads and shopping streets. Burgh Surveyor, 2 George Place, Bathgate.

Feb. 25.—Fife. Electrical installation in extension to Buckhaven mining school. Quantity Surveyors are James Gentles and Son, Central Chambers, Kirkcaldy.

Feb. 25.—Gateshead T.C. Electrical installation at St. Cuthbert's School in Derwentwater Rd. Chief Architect, Municipal Buildings, Swinburne St. Deposit £2 2s. (See Feb. 7 issue.)

Feb. 25.—Hastings T.C. Rewiring of electrical installation at Clive Vale secondary school. Borough Engineer, 37 Wellington Sq. Deposit £2 2s.

Feb. 25.—Herne Bay U.D.C. Supply and installation of two electrically-driven sewage pumping units each of 500 g.p.m. capacity, with switchgear, etc. W. W. Smith, Engineer and Surveyor, Council Offices. Deposit £2 2s.

Feb. 25.—Luton T.C. Tenders invited for effecting conversion to sodium lighting in several streets, including erection of concrete columns and fitting and wiring of lanterns and equipment. Borough Engineer's Office, Town Hall. Deposit £2 2s.

Feb. 25.—N. Ireland. Electrical work in erection of 82 dwellings at Carnmoney and 20 at Portavogue for N. Ireland Housing Trust. Trust is at 12 Hope St., Belfast. Deposit 10s. for each scheme.

Feb. 25.—Stockport. Electrical installation extensions to Buckhaven Mining School. Quantity Surveyor, James Gentles and Son, Central Chambers, Kirkcaldy.

Feb. 25.—Tynemouth T.C. Supplies required of electric lamps and cables, and lamp columns and reflectors for year ending March 31, 1953. Borough Surveyor, D. M. O'herlihy 16, Northumberland Square, North Shields.

Feb. 25.—Wanstead and Woodford T.C. Installation of 250 W mercury vapour lighting in St. Barnabas Rd. and Latchett Rd. Work includes supply of 39 columns and lanterns with services and control gear. Borough Engineer and Surveyor, Municipal Offices, High Rd., E.18. Deposit £2. (Advertised in this issue.)

Feb. 25.—West Riding. Installation of electricity at Batley Purlwell Lane and Ossett Gawthorpe schools. County Architect, "Bishopgarth," Westfield Rd., Wakefield.

Feb. 26.—Towcester (Northants) P.C. Supply and installation of 28 fluorescent street lighting units to Group A on trunk road A.5. A. E. G. Kemsley, Clerk of Council, 5 Burcote Way. (See Jan. 31 issue.)

Feb. 27.—Macclesfield T.C. Supply and erection of 47 sodium lighting units in Class B mounted on concrete columns. J. S. Dossett, Borough Engineer, Town Hall. Deposit £2 2s. (Advertised in this issue.)

Feb. 27.—Tynemouth T.C. Supply and erection of four electrically operated pumping units, each of 1,300 g.p.m., at Mitford. Water Engineer and Manager, 8 Northumberland Sq., North Shields. Deposit £3 3s.

Feb. 28.—Dewsbury T.C. Supply of electric lamps, cable, lanterns, lighting columns. C. H. Midson, Street Lighting Engineer, 27 Baltye St. (See Jan. 24 issue.)

Feb. 29.—Liverpool. Supply of two 40-ton six-coupled diesel locomotives to Kirkby trading estate. City Engineer and Surveyor, Municipal Buildings, Dale St.

Mar. 1.—Bridgwater T.C. Supply and installation of two electrically driven pumps. Borough Engineer, Town Hall. Deposit £2 2s.

Mar. 1.—Dundalk U.D.C. Supply and installation of certain sewage pumping machinery, electric motors, switches, accessories, meter and ancillary equipment. J. A. Smyth, Town Clerk, Town Hall. Deposit £5 5s.

Mar. 1.—Stockport T.C. Electrical work in 53 houses on Thornley Lane Estate. Application to W. F. Gardner, Borough Surveyor, Town Hall, by Feb. 20.

Mar. 3.—Cheadle and Gatley U.D.C. Supply of concrete and cast iron lighting columns, lamps, lanterns, swan-neck brackets, and switching gear boxes for year ending Mar. 31, 1953. Duncan S. Graham, Engineer and Surveyor, Town Hall, Brentwood, Cheadle. (Advertised in this issue.)

Mar. 3.—Westhoughton U.D.C. Supply of electric lamps required for year ending Mar. 31, 1953. F. H. Walker, Surveyor, Town Hall.

Mar. 10.—Whittingham. Hospital Management Committee (near Preston) require supply of electric lamps for year ending Mar. 31, 1953. Secretary of Committee is W. A. Higgs.

Mar. 11.—East Riding. Installation of electrical services at Withernsea secondary school. Applications to County Architect, County Hall, Beverley. (See Jan. 24 issue.)

Mar. 22.—Kildare. Supply and installation of two direct drive electrically propelled pumps, including wiring, starters, switches, etc. Consulting Engineer, Nicholas O'Dwyer, 6 Burlington Rd., Dublin. Deposit £5 5s.

OVERSEAS

Details of items marked • may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.

Mar. 24.—Uruguay. Supply of a total of 31,500 metres of subterranean armoured cables for tension of 220 V and 135 cable boxes for Usinas Electricas y los Telefonos del Estado, Paraguay 3431, Montevideo. B.o.T. (Ref.: CRE 4633/52)•.

Mar. 31.—Turkey. Construction of grain silo to hold 10,000 tons of maize or other cereals. Work includes installation of mechanical electrical equipment, and electric generating. Direction Generale de l'Office des produits du sol, Ankara. B.o.T. (Ref. CRE (IB) 4086/52).•

Apr. 17.—India. Electricity Dept. of Govt. of Orissa invites tenders for supply of switchgear, transformers and substation equipment in Duduma transmission scheme. B.o.T. (Ref.: CRE 3448/52)•.

Apr. 22.—New Zealand. State Hydro-Electric Dept., Wellington, invites tenders for steel-cored aluminium transmission line conductor and accessories for Roxburgh-Dunedin 110 kV line. Specifications available at N.Z. Govt. Offices in London.

Your Queries — Answered

"Condor" refrigerators, makers of? E.C.—J. Brittain and Son (Engrs.) Ltd., Prospect Works, Oak St., Sheffield 8. (22116)

Dry-battery recharger, makers of? L.C.—We presume this enquirer refers to the "Activette" made by Amplion Ltd., 230 Tottenham Court Rd., W.1. (22123)

"O-Ray" electro radium dry compress, makers of? D.E.—Radium Electric Ltd., 153 Victoria St., S.W.1. (22135)

"Rolamatic" irons, makers of? J.J.—These were made by British Rola Co. Ltd., who are now Rola Celestion Ltd., Ferry Works, Summer Rd., Thames Ditton. The manufacture of the iron was discontinued about four years ago and there are no spares available. (22143)

"Burgoyne" soldering irons, address for spares? A.B.—D. Cohen, 67 Raleigh Ave., Hayes, Middx. G. A. Walsh, 127 Sloane St., S.W.1. (22152)

Drills for cut glass, makers of? E.I.—Indusmond (Diamond Tools) Ltd., 4 Greville St., E.C.1; Impregnated Diamond Products Ltd., Tuffley Cres., Gloucester. (22161)

ANSWERS WANTED

"Blaco Junior Tape Master" tape recorder, makers of? F.B. (22165)

Wall nail with an aluminium tag, as supplied to the Post Office, makers of? P.W. (22172)

The above are selected from questions we have answered this week. If you have a query, send it to us.

CONTRACTS PLACED

Adwick-le-Street (Yorks) U.D.C. Electrical installation in 146 houses on Woodlands estate, 74 houses and 12 flats on Carcroft estate, A. Miers and Co., Ltd.

Durham. Electrical installation at Horden Colliery county and girls' school, Doves (Darlington) Ltd., £64,97; same at Spennymoor King St. county school, North of England Engineering and Electrical Co. Ltd., £2,303.

Glendale R.D.C. Electrical installation in 64 houses at Wooler, Norman Young, £1,700.

Leek (Staffs) U.D.C. Wiring of houses in district, Midlands Electricity Board, £5,884.

Luton T.C. Installation of electrical services in 136 houses, Scientific Radio Service Co., Ltd., £4,540; and same in six blocks of flats, Williams and Richardson, Ltd., £3,033.

Maidstone T.C. Rewiring and replacements in 34 houses at Queen's Rd., Horton, Goodchild and Co., Ltd., £1,426.

Nantwich R.D.C. Electrical installation in 38 houses on various sites, C. Coxey, £1,258.

Peterborough. Electrical installation at Memorial Hospital, Grensells Ltd., £1,948.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Beresford Stork. 691,311. Class 7. Centrifugal pumps, submersible electrically-driven pumps, etc. James Beresford and Son Ltd., Kitts Green Works, Mackadown Lane, Marston Green, Birmingham.

Ela. 698,528. Class 7. Incubators for use in medical work and scientific research. Electricals Ltd., 14 Claremont Place, Newcastle-upon-Tyne 2.

Humicon. 703,442. Class 9. Hygrometers. Standard Telephones and Cables Ltd., Connaught House, 63 Aldwych, W.C.2.

Plastronic. 699,093. Class 9. Electric flash apparatus for use in photography. Harold Godfrey, 108 Horseferry Rd., S.W.1.

Twylite. 703,630. Class 9. Electric jugs and irons. Twylite Trading Co., 111 Little Lonsdale St., Melbourne C1. Australia.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	227 0 0	£220 0 0
LEAD, good soft pig (foreign)	170 0 0	152 0 0
,, ,, ,, "English" quality ...	171 10 0	—
TIN (99·99·75%) ... ... (Cash)	981-982	—
,, (3 months)	981-982	—
ALUMINIUM, commercial purity (del.)	148 0 0	—
ZINC	190 0 0	156 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	55 5 0	—
Mild Steel Tape (0·04 in.)	32 5 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Artlang International Ltd., exporters of accessories and electrical goods and allied merchandise. First and final dividend of 1s. 3½d. in £ payable at 52-54 High Holborn, W.C.1, on Feb. 25.

Wellgate Electrical Co. Ltd. Creditors should send particulars to liquidator, K. R. Cork, C.A., 19 Eastcheap, E.C.3, by Mar. 31.

Voluntary Liquidation

Electrical and Associated Services (Mumbles) Ltd., Swansea. At statutory meeting of creditors statement of affairs showed liabilities of £2,570. Assets estimated to produce £1,026 and after allowing £56 due to preferential creditors and £466 due to the debenture holder, there were net assets of £504, or deficiency as regarded unsecured creditors of £2,066. So far as members were concerned, there was total deficiency of £2,566. Resolution passed confirming voluntary liquidation with Mr. Baddill, 20 Walter Rd., Swansea, as liquidator, with committee of inspection. Creditors are asked to send particulars to him by Feb. 29.

BANKRUPTCY ACTS

Public Examination

Birmingham. Isaac Jackson, formerly trading as "Jackson's Electrical Supplies" at 103 Station Rd., Sutton Coldfield. Public examination at The Court House, Corporation St., Birmingham, on Mar. 19 at 10.30 a.m. (First meeting took place yesterday.)

Bradford. Thomas D. Long, trading as "T. D. Long," electrical contractor, at 664 Halifax Rd., Buttershaw. Public examination at County Court House, Manor Row, Bradford, on Mar. 14, at 10.30 a.m. First meeting at Official Receiver's office, Hallfield Chambers, 71 Manningham Lane, Bradford, at 11 a.m. tomorrow, Friday. Date of Receiving order, Feb. 6.

Truro. Reginald G. K. Dale and William B. Martin, trading as "Martindale" at 77 Meneage St., Helston, electrical contractors. Public examination at Town Hall, Truro, on Feb. 21 at 11.45 a.m. (First meeting was on Tuesday.) Date of receiving order, Jan. 24.

Receiving Order

Stoke. Frederick H. Bell, electrical engineer, trading at 4 Attwood St., Kidsgrove, Stoke. Date of receiving order, Feb. 4.

Appointment of Trustee

Walsall. Cyril G. Clews, trading as "Clews Electrical Co." at 226 Stafford St., Walsall. Trustee is R. E. Bendall, C.A., 126 Colmore Row, Birmingham.

TRADE NOTES

New Address.—As from Feb. 25, the head office of Multicore Solders Ltd. will be at the company's new factory at Marylands Ave., Hemel Hempstead. The offices at Mellier House, Albemarle St., are being retained only as London West End executive offices.

Change of Phone No.—As from Feb. 16, the telephone number of the Cardiff branch of British Insulated Callender's Cables Ltd., will be Cardiff 24716-7.

Licence.—Pye Ltd. announces that an agreement has been reached with "Radio Minerva," Milan, for the manufacture of Pye television receivers under licence in Italy. "Radio Minerva" is an established name on the Italian market. It has a modern plant in Milan manufacturing radio receivers and other electronic products.

BUSINESS PROSPECTS

HOME

Adwick-le-Street U.D.C. Erection of 220 houses in Woodlands scheme. W. S. Ellis, Engineer and Surveyor, Council Offices.

Andover (Hants) R.D.C. Plans approved for two blocks of flats at Shipton Bellinger and four blocks of houses at Grateley.

Batley T.C. Construction of 32 houses on Staincliffe estate. Borough Engineer, West House, Hanover St.

Berwick T.C. It is proposed to spend £3,500 on conversion of Guildhall to concert hall. Borough Engineer, J. Armitage, Municipal Buildings.

Bootle T.C. Erection of 40 dwellings on Sterrix Lane site. Borough Surveyor, Town Hall.

Croydon. Approval given to Scottish Union and National Insurance Co., Ltd., for construction of offices in Addiscombe Rd.

Darlington T.C. It is intended to build 950 houses on Bankssome estate, Cockerton. Borough Architect is E. A. Tornbohm. The Tees and Wear River Board has approved construction of a £7,000 laboratory.

East Riding. County Architect, County Hall, Beverley, invites applications from contractors desirous of having their names included in revised list being compiled. (Advertised in this issue.)

Grantham T.C. Plans in hand to install electricity in 64 houses in Turnor Crescent at estimated cost of £1,329, subject to tenants' concurrence to small addition to rent.

Hamilton T.C. Dean of Guild Court has approved erection of 58 houses on Udston-Hillhouse site.

Heanor (Derby) U.D.C. Erection of 52 houses on Marlpool Farm estate. R. Archer, Engineer and Surveyor, Council Offices.

Ilford. Motor Gear and Engineering Co., Ltd., propose to extend factory premises in High Street.

Lanchester (Dur.) R.D.C. Plans being prepared for a shopping centre at Hamsteels where it is proposed to build 200 houses.

Leicester. Erection of secondary school on New Parks estate. City Education Offices, Newark St.

Liverpool. Construction of 78 houses on Greenhill Rd. estate and 320 dwellings on Speke estate. City Architect and Director of Housing, Blackburn Chambers, Dale St., Kingsway.

Maidstone R.D.C. Erection of 52 houses on four sites. Engineer and Surveyor, 26 Tonbridge Road, Maidstone.

Marlborough. Oxford Regional Hospital Board recommended to approve first part of scheme for rewiring of Savernake Hospital.

March U.D.C. It is proposed to build 66 houses on Badgeney-Deerfield estate. Architect is W. S. Pickett.

North Shields. G. H. Gray in Camden St. is architect for factory additions in Gloucester Rd. on behalf of Torday, Ltd.

Norwich. Erection of 152 dwellings on North Park Ave. estate. City Architect's Office, City Hall.

Nottingham. City Council recommended to apply for approval to spend £106,885 on improvements to and purchase of equipment for Technical College.

Nuneaton T.C. Erection of 27 flats in Mount St. Borough Surveyor, Council House.

Rothwell (Yorks) U.D.C. Erection of eight blocks of flats in Lawrence Villa estates. Architect, Civic Buildings, Rothwell.

Smethwick T.C. Application likely to be made for sanction to borrow £12,000 for installation of electricity in municipal houses. Approval has been given for 216 on Branchall Road site.

Tynemouth T.C. Fresh tenders to be obtained for 254 houses at Chirton Grange. Borough Engineer is D. M. O'herlihy, 16 Northumberland Sq., N. Shields.

Worcester. Construction of three-storey block of flats and maisonettes on Newtown estate. City Engineer and Surveyor, 22 Bridge Street.

OVERSEAS

Brazil. Director of Port of Rio de Janeiro is anxious to place orders shortly for refrigerating equipment sufficient for warehousing of 10,000 tons of meat.

Holland. Air-cooled petrol engines with electric starters suitable for construction of generating sets, 1,500-1,800 r.p.m., required by Ingeniuersbureau Verel, Parkweg 18, The Hague.

Thailand. Bee Tat Trading Co., Ltd., 917 Songwad Rd., Bangkok, wish to contact U.K. manufacturers of diesel and oil engines of from 2 to 4 h.p.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

J. Allen and Sons Ltd. Builders and contractors, plumbers, electricians, etc. Nom. cap.: £1,500. Dirs.: J. Allen, 4 Anstey Rd., Reading, W. J. Allen, J. H. Allen, A. E. Allen and F. C. Allen.

Autopower (1952) Ltd., 7, 8, 9 and 10 Oxford St., Swansea. Manufacturers of and dealers in batteries, accumulators and motor accessories, etc. Nom. cap.: £2,500. Dirs.: M. E. Griffiths, and D. Doolan.

British Fibrak Separator Co. Ltd. To acquire from Oldham and Sons, Ltd., of Denton, nr. Manchester, world rights in the Fibrak Separator for use in electrical storage batteries; to manufacture and vend such separators, and to carry on business of mining, electrical and mechanical engineers, etc. Nom. cap.: £1,000. Dirs.: to be appointed by subs. Subs.: G. Oldham, Lowther Grange, Prestbury; and S. J. Wrigglesworth, 15 Birchvale Drive, Romiley, Ches.

Easiway Electrical Co. Ltd., 68 Cross St., Manchester, 18. Nom. cap.: £7,500. Dirs.: T. Flynn and Florence Flynn.

Edwin Crook and Co. Ltd., 6 Carnaby St., W.1. Radio, electrical, mechanical and general engineers and contractors, etc. Nom. cap.: £1,000. Dirs.: S. C. Wheeler and Mrs. W. Wheeler.

Graham Berrie, Ltd., 1 The Highgate, Kenton, Newcastle-on-Tyne. To take over business of an electrical contractor carried on at Kenton, Newcastle-on-Tyne, by Eric Graham Berrie, electrical, wireless, television and general engineers, etc. Nom. cap.: £1,000. Permt. dirs.: E. G. Berrie and Mrs. A. Berrie.

MEETINGS TO NOTE

THURSDAY, FEB. 14

INCORP. PLANT ENGRS. (Kent Branch).—"Utilisation of Refrigeration in War." Queens Head Hotel, Maidstone, 7 p.m.

E.P.E.A. (Merseyside Tech. Group).—"Switchgear Development." J.A.F. Harvey, Elect. Showroom, Whitechapel, Liverpool, 7 p.m.

E.P.E.A. (W. Yorks. Tech. Group)—"Turbo-Jet Propulsion." N. R. Chandler. Y.E.B., Whitehall Rd., Leeds, 6.45 p.m.

ENGINEERS' GUILD.—Debate on "Nationalisation of Industry does not adversely effect status of Professional Engineer." Caxton Hall, S.W.1, 6 p.m.

I.E.S. (Glasgow Centre).—"Brightness Engineering." W. Robinson. 39 Elmbank Cres., Glasgow, 6.30 p.m.

I.E.S. (Leicester Centre).—"Lighting of the *Queen Elizabeth* and *Caronia*." T. Cotten. E. Midlands Elect. Board, Charles St., 6.30 p.m.

I.E.S. (Manchester Centre).—"Lighting and Vision in Advancing Age." H. C. Weston. Town Hall Extension, 6 p.m.

I.E.E. (E. Midland Centre).—"Modern Development in Electric Welding." District meeting at George Hotel, Kettering, 7.30 p.m.

I.E.E. (W. Wales sub-centre).—"Electrical Installations in Large Chemical Factories." D. B. Hogg. Central Public Library, Swansea, 6 p.m.

FRIDAY, FEB. 15

INSTN. OF MECHANICAL ENGRS.—"Allocation of Machines to Operators." T. F. O'Connor. Storey's Gate, S.W.1, 5.30 p.m.

JNR. INSTN. OF ENGINEERS.—"Recent Developments in Arc Welding Electrodes." D. H. Young. 39 Victoria St., S.W.1, 6.30 p.m.

I.E.E. (N. Ireland Centre).—Annual conversazione and visit of President. Grand Central Hall, Belfast, 6.45 p.m.

I.E.E. (N.E. Students Section).—"Water Power." C. W. D. Carradice Neville Hall, Westgate Rd., Newcastle, 6.30 p.m.

MONDAY, FEB. 18

E.P.E.A. (London Tech. Group).—"Modern Insulated Materials." R. F. Archer. Caxton Hall, S.W.1, 7 p.m.

BIRMINGHAM ELECTRIC CLUB.—"Cavity Magnetron and Radar." Prof. J. Sayers. Grand Hotel, 6.15 p.m.

POSTPONED

Following on the death of H.M. the King we have been notified of the postponement of the following functions: the Power Farming Conference (February 12); the E.R.A. Luncheon from Feb. 8 to Feb. 22; the Institution of Heating and Ventilating Engineers' Dinner until March 11th; Electrical Trades Commercial Travellers' Association Luncheon until March 7th; and the E.I.B.A. Birmingham) Dance from February 15th to 29th.

I.E.S. (Sheffield Centre).—"Electric Lighting—Contractors Viewpoint." J. Ashmore. The University, Western Bank, 6.30 p.m.

I.E.E. (Merseyside and N. Wales Centre).—"Characteristics and Control of Rectifier-Motor Variable-Speed Drives." P. Bingley. Liverpool Royal Instn., Colquitt St., 6.30 p.m.

I.E.E. (N.E. Radio and Measurements Group).—"Design of Practical d.c. Amplifier based on Second-Harmonic Type of Magnetic Modulator." S. W. Noble and P. J. Baxendall. King's College, Newcastle, 6.15 p.m.

I.E.E. (Western Supply Group).—"Protection of Electrical Power Systems—Critical Review of present-day Practice and Recent Progress." H. Leyburn and C. H. W. Lackey. S. Wales Inst. of Engrs., Park Place, Cardiff, 6 p.m.

TUESDAY, FEB. 19

A.S.E.E.—"Scope and Application of Metal Rectifiers." Donald Ashby. L.S.B., Savoy Hill, W.C.2, 6.30 p.m.

INST. OF FUEL (London).—"Investigation of Wholehouse Heating." F. C. Lant and Dr. J. C. Weston. Storey's Gate, St. James's Pk., S.W.1, 5.30 p.m.

INST. OF FUEL (Midland Section).—"Measurement of Transient Temperatures." D. K. Mackenzie and Miss R. Milne. James Watt Inst., Gt. Charles St., Birmingham, 6 p.m.

DUMFRIES AND GALLOWAY ELECTRICAL SOC.—"Radar-Marine Navigation." M. J. Millane. Ewart Library, Dumfries, 7.30 p.m.

I.E.E. (London Measurements Group).—"Automatic Compensation of Zero-Drift Errors in direct-coupled Feedback Systems," F. A. Summerlin; "High-Gain d.c. Amplifiers," K. Kandia and D. E. Brown; "Design of Practical d.c. Amplifier based on Second-Harmonic Type of Magnetic Modulator," S. W. Noble and P. J. Baxendall. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Midland Utilisation Group).—"Electrical Control of Dangerous Machinery and Processes: Pt. 3 Remote Supervisory Control." W. Fordham Cooper. The University, Leeds, 6.30 p.m.

WEDNESDAY, FEB. 20

A.S.E.E. (Coventry Branch).—"Problems of Large Store Electrical Equipment." A. W. Jervis. Technical College, 7.15 p.m.

A.S.E.E. (Manchester Branch).—"Cold Cathode Lighting." J. S. Smythe. Engineers' Club, Albert Sq., 7.30 p.m.

BRITISH INSTN. OF RADIO ENGRS. (London).—"Search Radar for Civil Aircraft." P. L. Stride. School of Hygiene, Keppel St., W.C.1, 6.30 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (Liverpool Branch).—"Centrifugal Pumps and their Applications to Heating Systems." G. R. Radcliff. Radiant House, Bold St., 6.30 p.m.

I.E.S. (Tees-side Group).—"Hospital Lighting" J. K. Frisby. Cleveland Scientific and Tech. Instn., Gorporation Rd., Middlesbrough, 6.30 p.m.

I.E.E. (N. Midland Centre).—"Electrical Control of Dangerous Machinery and Processes: Pt. 2 Electrically Interlocked Guards on Machines." W. Fordham Cooper. Y.E.B., Ferensway, Hull, 7.30 p.m.

I.E.E. (Sheffield sub-centre).—"Metadynes." A. A. L. Bentall. Grand Hotel, 6.30 p.m.

I.E.E. (N.W. Radio Group).—"Review of Some TV Pick-up Tubes." J. D. McGee. Engineers' Club, Albert Sq., Manchester, 6.15 p.m.

I.E.E. (S.W. sub-centre).—"Structure, Electrical Properties and Applications of the Barium-Titonate Class of Ceramic Materials." Prof. Willis Jackson. Standard Telephone Works Canteen, Ilminster, 4 p.m.

BUSINESS EFFICIENCY EXHIBITION.—Opens in Birmingham and runs until March 1.

THURSDAY, FEB. 21

INST. OF WELDING (N. London Branch).—"Welding and Prefabrication in Shipbuilding." D. M. Kerr. Polytechnic Inst., Regent St., W.1, 7.30 p.m.

INCORP. PLANT ENGRS. (Liverpool Branch).—"Refrigeration." W. F. Ball, Radiant House, Bold St., 7.15 p.m.

I.E.E. (Southern Centre).—Annual dinner and dance at Polygon Hotel, Southampton, 7 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (Birmingham Branch).—"Electronics as Applied to Temperature and Combustion Control." H. A. Stevenson and L. Neall. Imperial Hotel, 6.30 p.m.

I.E.S. (Gloucester & Cheltenham Centre).—"Lighting of the New House of Commons." C. Dykes Brown. Cadena Cafe, High St., Cheltenham, 6.15 p.m.

I.E.S. (Bradford Group).—"School of Lighting." J. F. Roper. Y.E.B., 45/53 Sunbridge Rd., 7.30 p.m.

I.E.E. (London Utilisation Section).—"Inherent Current, Voltage and Speed Control Dynamo-Electric Machinery." J. C. Macfarlane, J. W. Macfarlane and W. J. Macfarlane. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (E. Midland Centre).—"Protection of Electrical Power Systems—Critical Review of present-day Practice and Recent Progress." H. Leyburn. District meeting at Duke of Wellington Hotel, Broadgate, Lincoln, 7.15 p.m.

I.E.E. (Irish Branch).—"Electrical Equipment of the Eire Hydro-Stations." J. B. S. Lawler, J. A. V. McEvoy, S. E. O'Neill and B. Unden. Trinity College, Dublin, 6 p.m.

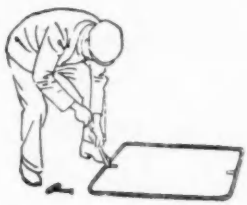
FRIDAY, FEB. 22

JNR. INSTN. OF ENGINEERS.—"Lessons of Anglo-American Productivity Reports." R. G. Hooker. 39 Victoria St., S.W.1, 6.30 p.m.

I.E.E. (London Educ. Circle).—Discussion on "Engineering Graduation Theses at University of Cape Town." Prof. B. L. Goodlet. Savoy Place, W.C.2, 6 p.m.

Note these features

The unique features embodied in the construction of the 'Holborn' Frame and Cover have ensured its popularity amongst users all over the world.



1. **THE COVER SLIDES** easily into and out of the Frame.
2. **ROUNDED CORNERS** give added strength to resist breakage in transit and handling. Fig. 1.
3. **EASY TO REMOVE**—The inclined section prevents dirt and foreign matter wedging the joint. Fig. 2.
4. **NON-SLIP.** Narrow raised serrated edges, scarcely noticed in made-up pathway, minimise slipping by pedestrians.
5. **CORRECT POSITIONING** of cover in frame is ensured by special combined location and pinch bar slot.
6. **TESTS FOR STRENGTH.** Larger size pavement frames and covers were proven in successful weight tests of over 3 tons dead load and half a ton rolling load.
7. **NAME PLATES** available. Loose cast iron plates avoid the necessity of specially cast covers.
8. **WIDE RANGE OF SIZES** to meet all normal requirements.

FIG. 1

FIG. 2

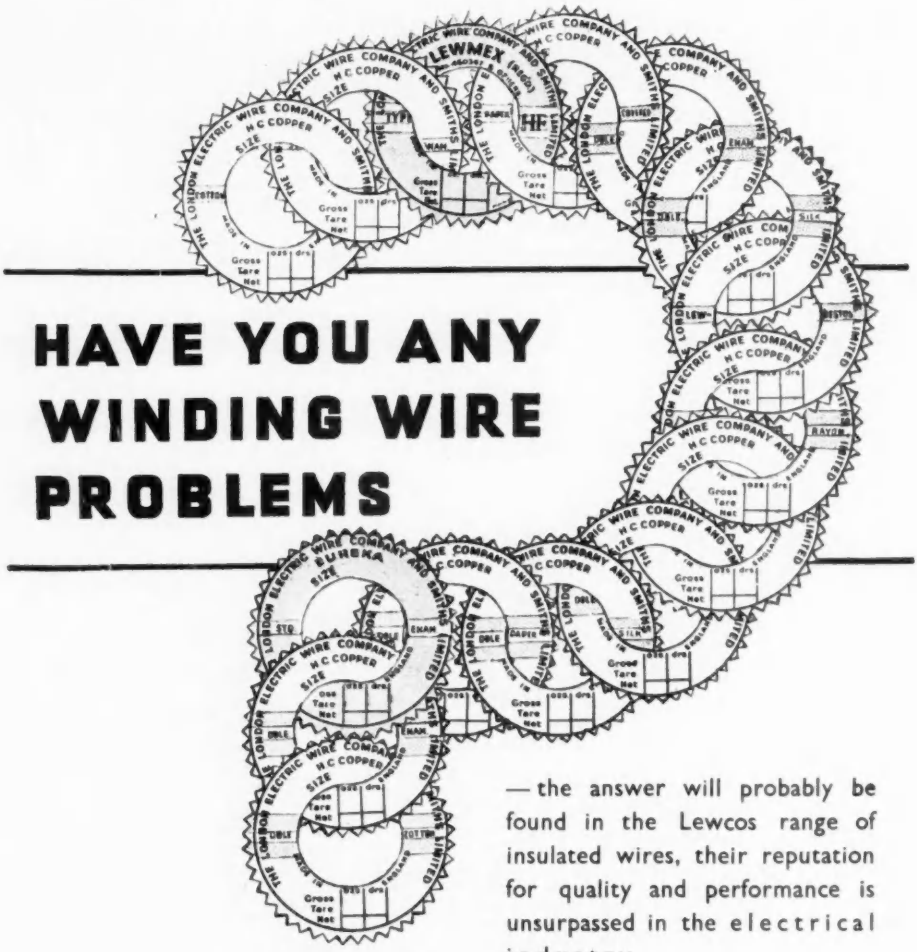
Ask for Catalogue 28

HENLEY

"HOLBORN" PAVEMENT FRAMES AND COVERS

(Covers are supplied without concrete filling.)

W. T. HENLEY'S TELEGRAPH WORKS COMPANY LTD.
51-53 HATTON GARDEN
LONDON, E.C.1.



HAVE YOU ANY WINDING WIRE PROBLEMS

— the answer will probably be found in the Lewcos range of insulated wires, their reputation for quality and performance is unsurpassed in the electrical industry.

Over 70 years experience and knowledge relating to the most suitable type of covering for a specific application is at your disposal.

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS, LIMITED
LEYTON, LONDON, E.10.
Incorporating FREDERICK SMITH AND COMPANY
Associated with THE LIVERPOOL ELECTRIC CABLE CO., LTD., AND VACTITE WIRE CO., LTD.

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

PUBLIC NOTICES

EAST RIDING OF YORKSHIRE COUNTY COUNCIL

LIST OF CONTRACTORS

THE COUNTY ARCHITECT would be pleased to receive applications from Contractors, Specialist Firms and Tradesmen who are desirous of having their names considered for inclusion in a revised list which is now being compiled for use in his department.

Contractors should state the maximum amount of contracts for which they would be prepared to tender and also give the names of references or, if possible, the names of Local Authorities for whom they have carried out work, at the same time stating the nature and the value of such work.

Applications should be addressed to the County Architect, County Hall, Beverley.

T. STEPHENSON,
Clerk of the Council.

County Hall, Beverley.
February, 1952. (R 72)

TENDERS INVITED

BOROUGH OF WANSTEAD AND WOODFORD

ST. BARNABAS ROAD AND LATCHETT ROAD LIGHTING

TENDERS are invited for the installation of 250 W Mercury Vapour Lighting in the above-mentioned streets. The work includes the Supply and Erection of 39 Columns and Lanterns, together with Services and Control Gear.

Specification, Bill of Quantities and Form of Tender may be obtained from Borough Engineer and Surveyor upon receipt of £2 deposit, which will be returned to bona-fide Tenderers.

Tenders, in sealed envelopes supplied by the Council endorsed "Tender for Street Lighting," and in no way marked to indicate the sender, to be delivered by post to the undersigned by noon on February 25, 1952.

The Council do not bind themselves to accept the lowest or any Tender.

A. McCARLIE FINDLAY,
Town Clerk.

Municipal Offices,
High Road, E.18. (R 71)

BOROUGH OF MACCLESFIELD

CLASS B STREET LIGHTING
WESTON—SCHEME V

TENDERS are invited for the supply and erection of 47 sodium lighting units mounted on pre-cast concrete columns.

Plans, and Conditions of Contract may be seen and Specification and Form of Tender obtained from Mr. J. H. Dossett, A.M.I.C.E., Borough Engineer, Town Hall, Macclesfield, on payment of a deposit of £2 2s., to be returned on receipt of a bona fide tender together with all documents.

Tenders, in plain sealed envelopes, endorsed "Street Lighting," must be delivered to the undersigned not later than noon on Wednesday, February 27, 1952.

The Council do not bind themselves to accept the lowest or any tender.

WALTER ISAAC,
Town Clerk.

Town Hall, Macclesfield.
February 7, 1952. (R 73)

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL

TENDERS FOR STREET LIGHTING STORES

TENDERS are invited for the supply of the undermentioned materials for the year ending March 31, 1953:—

CONCRETE LIGHTING COLUMNS
CAST IRON LIGHTING COLUMNS
ELECTRIC LAMPS
LANTERNS
SWAN-NECK BRACKETS
SWITCHING GEAR BOXES

Specifications and forms of tender may be obtained from Mr. Duncan S. Graham, Engineer and Surveyor, Town Hall, Bruntwood, Cheadle, Cheshire.

Tenders, in plain envelopes, duly sealed and endorsed "Tenders—Street Lighting Stores," to be delivered to the undersigned not later than 10 a.m. on Monday, March 3, 1952.

The Council do not bind themselves to accept the lowest or any tender.

W. TIMPERLEY,
Clerk to the Council.

Town Hall, Bruntwood,
Cheadle, Cheshire.
February 1, 1952. (R 42)

APPOINTMENTS VACANT

BOROUGH OF BECKENHAM

APPOINTMENT OF STREET LIGHTING FOREMAN

APPLICATIONS are invited for the appointment of Street Lighting Foreman, who must be an Electrician by trade, at a rate of pay of £8 15s. 0d. per 44-hour week. The person appointed will be employed in the Borough Engineer's Department as Street Lighting Foreman but will also be required to carry out testing and maintenance work, etc., on the Council's various electrical installations.

Written applications, stating age, experience and present employment, endorsed "Street Lighting Foreman," should be delivered to the Borough Engineer not later than 5 p.m. on Monday, February 25, 1952. Applicants should give the names and addresses of two persons as references and state whether they are able to drive a motor vehicle.

C. ERIC STADDON,
Town Clerk.

Town Hall,
Beckenham, Kent. (R 55)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following superannuable position. Salary and conditions of service will be in accordance with the National Joint Board Agreement.

STATION SHIFT CONTROL ENGINEER
Bedford Generating Station

Salary Class "D," Grade 10, £511-£527.

Applicants should have reached the standard of Ordinary National Certificate in Electrical Engineering or its equivalent, have experience in the operation of a switchboard at a generating station and be fully conversant with high voltage switching operations and protective systems.

Applications, stating age, experience and present position, should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than February 29, 1952.

W. N. C. CLINCH,
Controller.
(R 86)

CITY COUNCIL OF SINGAPORE ELECTRICITY DEPARTMENT

THE COUNCIL has under construction a new Power Station for which orders have been placed for four 25,000 kW turbo-alternators together with six 187,500 lb boilers at 600 lb/p.s.i., 825° F, switchgear and ancillary equipment. The ultimate capacity of this station will be 150,000 kW.

To meet this large-scale expansion the Council invites applications for the following posts on the Permanent Establishment of the Electricity Department. Appointments will be on a three-years' agreement in the first instance. The age of retirement for officers on the Permanent Establishment is 55.

Post	Minimum Age	Basic salary scale p.a.
A. DEPUTY ELECTRICAL ENGINEER	35	£2,310 fixed
B. POWER STATION SUPT. ...	33	£1,470-£1,610
C. ASST. POWER STATION SUPT. ...	31	£1,274-£1,400
D. MAINTENANCE ENGINEER—Boiler House and Turbine Room	28/29	£1,050-£1,218
E. MAINTENANCE ENGINEER (Elec.)	28/29	£1,050-£1,218
F. ASST. DISTRICT ENGINEERS ...	25	£1,050-£1,218
G. TECHNICAL AND PLANNING ENGINEER	32	£1,680-£1,820
H. JUNIOR TECHNICAL ASSISTANTS	28	£1,050-£1,218
I. JUNIOR COMMERCIAL ENGINEER	25	£770-£840

Salaries are payable in Malayan dollars. $1 Malayan equals 2s. 4d.

Variable cost-of-living allowance and expatriation allowance are also payable, which at current rates would supplement the above basic salaries by amounts ranging from 34% to 102% according to salary and whether single, married or married with children.

Partly furnished quarters provided, if available, at 8% of basic salary or rent allowance (at present 12% of basic salary—maximum $120 per month) paid in lieu. Passages will be provided for each officer appointed, his wife and children under the age of 12 years at the date of sailing.

Leave: 1 month per year of service, plus period of voyage, on satisfactory completion of agreement; or 4 days a month of resident service, plus voyage leave after 48 months if appointed to the permanent staff and thereafter at shorter periods. 14 days local leave per year.

Compulsory provident fund contributions at present 7½% of salary, plus expatriation allowance to which the City Council donates 7½%, rising to 10% after 10 years' service, 15% after 15 years' service and 20% after 20 years' service. This scheme is under review.

Please write briefly giving details of qualifications, experience and age, etc., to Peirce and Williams (Agents to the Council), 1 Victoria Street, London S.W.1. A memorandum will be sent to applicants considered suitable, who will then be asked to submit in duplicate their full applications.

Closing dates for full applications:—
Post A: Tuesday, March 11; Posts B to E: Tuesday, March 18; Posts F to I: Tuesday, March 25. (R 99)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointment:—

No. 2 (Huddersfield) Sub-Area

INSTALLATION ENGINEER (Halifax District)
(Vacancy No. 6/52)

The person appointed will be required to take charge of the Contracting Section including the supervision of manual workers, and must be capable of preparing and supervising schemes for all classes of domestic, commercial and industrial installations, including specifications, estimates, and tenders. A thorough knowledge of the Electricity Supply Regulations and the I.E.E. Regulations for the Electrical Equipment of Buildings is essential.

Salary: N.J.B. Agreement Class G Grade 8, £658/£683 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications, and experience, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, within 14 days of the appearance of this advertisement. (R 74)

EASTERN ELECTRICITY BOARD

APPOINTMENT OF SECRETARY

APPLICATIONS are invited from suitably qualified candidates for the post of Secretary to the Eastern Electricity Board.

The vacancy arises through the appointment of Mr. Arthur Bond, the present Secretary and Solicitor to the Board, to be Deputy Chairman of the Yorkshire Electricity Board.

The appointment is superannuable and the salary will be £2,750 a year.

Applications, to arrive not later than February 29, 1952, should be addressed to The Chairman, Eastern Electricity Board, Wherstead, Ipswich, Suffolk. (R 3)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

(Vacancy No. 11/52)

APPLICATIONS are invited for the following superannuable appointments at the new Uskmouth power station, near Newport.

1. MAINTENANCE ENGINEER (Mechanical). N.J.B. Class "K," Grade 6 (£911-£952).
2. SHIFT CHARGE ENGINEERS. N.J.B. Class "K," Grade 7 (£844-£881).

The classification will eventually be raised to Class "L."

Applicants for appointment (1) should have wide experience in power station mechanical maintenance and should preferably be corporate members of the Institution of Mechanical Engineers or hold equivalent qualifications. For appointment (2) applicants should preferably have obtained the Higher National Certificate and served a regular apprenticeship. Previous operational experience in a modern generating station is essential.

Application forms, obtainable from the Divisional Secretary at the address below, should be returned by February 26, 1952.

H. J. BENNETT,
Divisional Controller.

British Electricity Authority,
Cardiff (Pengam Moors) Airport, Cardiff.
February 6, 1952. (R 98)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited from suitably qualified persons for the following position:—

11/52. SHIFT CHARGE ENGINEER, Loughborough.

Applicants should have sound technical training and be experienced in the operation and maintenance of steam power station plant. The possession of an Ordinary National Certificate in Engineering, or its equivalent, will be an advantage.

The salary for the above appointment will be in accordance with Grade 7, Class "B" of the N.J.B. Agreement, commencing at £539 p.a., and the position will be superannuable within the terms and conditions of the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned not later than February 18, 1952.

L. F. JEFFREY,
Divisional Controller.
February 1, 1952. (R 25)

NORTH EASTERN ELECTRICITY BOARD

York Sub-Area

APPLICATIONS are invited for the appointment of FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER, Scarborough District.

Applicants should have had a sound technical and practical training and be competent to prepare estimates for, and supervise, electrical installations, and to advise consumers on all matters relating to tariffs and electrical apparatus.

Salary scale, Schedule A, Class "D", Grade 6, £645 to £668 per annum. N.J.B. conditions of service.

Applications, stating age, qualifications and experience should be forwarded to the Secretary (Establishments), The North Eastern Electricity Board, Carliol House, Newcastle-upon-Tyne 1, within 10 days of the appearance of this advertisement. (R 100)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

SHIFT CHARGE ENGINEER required at Hams Hall "B" generating station, near Birmingham. National Joint Board service conditions, superannuable appointment. Commencing salary in accordance with Schedule A, Class "K," Grade 7, £844 per annum.

Sound technical training and practical experience in control and operation of a large power station, including pulverised fuel plant, required, together with Higher National Certificate in electrical and mechanical engineering. Corporate membership of the Institution of Electrical and/or Mechanical Engineers an advantage.

Forms of application available from Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, to be returned by March 1, 1952.

F. W. LAWTON,
Divisional Controller.
(R 84)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited from suitably qualified persons for the following positions:

12/52 ASSISTANT MECHANICAL MAINTENANCE ENGINEER (Boiler House), Spondon.

Applicants should have had a thorough mechanical training and possess considerable experience in the maintenance of all types of boiler house equipment to be found in large generating stations. Preference will be given to holders of an Ordinary National Certificate in Mechanical Engineering or its equivalent.

The salary for this appointment will be in accordance with Class "H," Grade 9, of the National Joint Board Agreement.

13/52 DIVISIONAL CHEMIST, Generation Operation Department, Div. Headquarters.

Applicants should preferably hold a University degree in chemistry and/or be a corporate member of the Royal Institute of Chemistry. Candidates must have a wide experience in the analysis and behaviour of oil, water and fuel associated with high pressure and high temperature power station plant. Candidates should clearly express their knowledge and experience of research and practice associated with metallurgy and metalography in respect of metals and alloys used on high-temperature steam plant.

The duties of this post will include the full technical direction of the staff and laboratories of all power stations in the Division, and special surveys and research work, either at a central laboratory or through the existing Divisional arrangements.

The salary for the above appointment will be in accordance with Schedule C, Class "AX/DX," Grade 1, of the National Joint Board Agreement.

17/52 JUNIOR ENGINEER, Hinckley

Applicants should have a sound technical training and experience in power station operation would be an advantage.

The salary will be in accordance with Class "B," Grade 12, £389-£405 per annum, of the National Joint Board Agreement.

The above positions will be superannuable within the terms and conditions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned not later than February 29, 1952.

L. F. JEFFREY,
Divisional Controller.

February 8, 1952. (R 83)

LONDON ELECTRICITY BOARD

'SENIOR ASSISTANT, COMMERCIAL DEPARTMENT

APPLICATIONS are invited for the above position on the staff of the Sub-Area Commercial Officer at Aldersgate Street, London E.C.1.

Applicants should have had experience in the commercial development of electricity supply, including electrical contracting activities and consumers' service sections and the administration of consumer service offices. Preference will be given to applicants who possess the Higher National Certificate in Electrical Engineering or its equivalent.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 4, i.e., £560 to £620 per annum, plus the appropriate London Allowance.

Application forms, obtainable from Establishments Officer, 46 New Broad Street, E.C.2, to be returned completed by February 20, 1952. Please enclose addressed envelope and quote ref. V/1397/T on all correspondence. (R 52)

SOUTH EASTERN ELECTRICITY BOARD

TWO THIRD ASSISTANT ENGINEERS, Sub-Area, Dorking, Surrey. (a) Planning and development; (b) construction and operation.

Salary for each post, £699-£728 p.a., under N.J.B. Schedule, Class "K," Grade 10. Superannuation will be arranged.

Applicants should preferably be corporate or graduate members of the I.E.E. with responsible experience of underground and overhead transmission and distribution systems, including indoor and outdoor substations up to 33 kV, in the following branches: for post (a) system calculations, network design and estimating; post (b) construction and/or operation and maintenance, particularly transmission lines and major substations.

Application forms obtainable from C. W. Hughes, B.Sc., M.I.E.E., Surrey Manager, SEEBoard, Horsham Road, Dorking, Surrey, to be returned by February 25, 1952.

A. L. BURNELL,
Secretary.

February, 1952. (R 85)

AIR MINISTRY

AIR MINISTRY require MECHANICAL and ELECTRICAL ENGINEERS for duty in their Works Department in connection with the design, operation and maintenance of ground mechanical and electrical works services on R.A.F. stations at home and overseas and on civil aviation stations. Appointments will be in two grades with a salary of (1) £600 to £900 (D 19/48/A), or (2) £900 to £1,200 (D 370/50/A) respectively. Provincial rates are somewhat lower. Commencing salary will be in accordance with age, qualifications and experience. A special allowance of up to £800 a year is payable in addition to salary during overseas service. Candidates must be natural born British subjects. The minimum qualifications and experience required for both grades of post are: (i) (a) University degree or equivalent diploma in electrical and/or mechanical engineering and have had at least a two-year apprenticeship, or (b) Graduate or Corporate Membership of the Institution of Electrical Engineers, or of the Institution of Mechanical Engineers, with appreciable electrical engineering experience, and have served at least a three year apprenticeship, and (ii) have been employed in a responsible position for a minimum of three years with a well-established engineering concern, and there have gained wide experience in electrical and mechanical engineering practice.

Application forms from Ministry of Labour and National Service, Technical and Scientific Register (K), Almack House, 26 King Street, London S.W.1, quoting D 19/48-A or D 370/50-A. (P 654)

ALBRIGHT AND WILSON LTD., have a vacancy for an ELECTRICAL ENGINEER for maintenance work at the works at Oldbury. Candidates should be aged under 30, be educated to degree standard and have obtained suitable experience since completing an apprenticeship. A bonus is normally payable and a non-contributory pension scheme is in operation.—Applications should be sent to the Appointments Officer, Albright and Wilson Ltd., Oldbury, Birmingham. (R 58)

APPLICATIONS are invited by a large electrical engineering firm in the Midlands to fill TWO AREA SUPERINTENDENT POSTS in the export sales organisation. Applicants should have had a good general education and possess technical qualifications of A.M.I.E.E. together with full studentship or apprenticeship in electrical engineering and have good all-round technical knowledge of turbine, transformer, switchgear and electrical machines. Commercial experience should include at least three years overseas experience, preferably on sales, though applicants with operating or supervisory experience, otherwise suitably qualified, will be considered. A good knowledge of export work is essential. Duties involve the complete supervision of the company's export business, one appointment to cover the Eastern hemisphere, the other to cover Africa and Europe. The ability to meet and entertain visitors and to discuss technical and commercial matters is essential. The posts will be based at the Company's Head Office attached to the works but there may be occasional opportunities for overseas travel. Age range 35 to 45. Salary up to four figures with excellent conditions of service.—Please apply in confidence with full details to Box No. 1453, Electrical Times. (R 31)

ASSISTANT SHIFT CHARGE ENGINEER at Littlebrook Power Station. Technical qualifications equivalent to Grad. Membership of either Institution of Mechanical or Electrical Engineers. Responsible experience of the operation of modern high pressure power station plant and a good knowledge of efficient operation of boiler and turbine plant essential. P.F. experience advantageous. N.J.B. Conditions Class "J" Grade 9, £733 19s. p.a. including London allowance.—Apply by February 25, 1952, on forms obtainable from British Electricity Authority, S.E. Division, Lower Ham Road, Kingston-on-Thames. (R 75)

BRITISH ELECTRICITY AUTHORITY, North Western Division, requires: Vacancy No. 666—SHIFT CHARGE ENGINEER at Generating Station, Whitehaven. Salary, £473 to £518 (N.J.B., A.7). Vacancy No. 667—MAINTENANCE ENGINEER (Mech.) at Trafford Generating Station, Manchester. Salary £713 to £747 (N.J.B. F.6). Vacancy No. 668—STATION SHIFT CONTROL ENGINEERS at the Generating Station, Burnley. Salary £482 to £501 (N.J.B. C.10). Vacancy No. 669—MAINTENANCE ENGINEER (Mech.) at Agecroft L.P. Generating Station, Salford, Lancs. Salary £713 to £747 (N.J.B. F.6).—Apply to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before February 23. Quote vacancy number. (R 61)

DRAUGHTSMAN having works training and experience with power transformers up to 44 kV and 3,000 kVA. Ordinary National Certificate preferred. Working conditions admirable. Salary according to age and experience.—Box No. 1443, Electrical Times. (R 9)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

BRITISH ELECTRICITY AUTHORITY require SCIENTIFIC STAFF in the Research Laboratories at Leatherhead. Candidates should have University Degree or equivalent qualifications and preferably research experience. Duties include study of electrical and mechanical properties of overhead line conductors. Salary: N.J.B. Grade 5, £511–£645 rising to £708 or Grade 6 £575–£506 rising to £586. Contributory superannuation. Forms from D. Moffat, Director of Establishments, British Electricity House, 170 Great Portland Street, London, W.1, to be returned by March 3. Quote reference AE.228. (R 81)

DRAWING AND TRACING, LTD., have vacancies for experienced SENIOR DRAUGHTSMEN and JUNIOR DETAIL DRAUGHTSMEN in their production drawing office, specialising in radio, electrical and mechanical engineering. 5-day week. Pension scheme. Good working conditions. Salary range £390–£533.—Write, stating age and experience, 456 Ewell Road, Surbiton, Surrey. (P 431)

EDITORIAL ASSISTANT, in a senior capacity, for electrical engineering journal. Engineering or Science Degree necessary, and also experience in subediting of high-class technical copy. Knowledge of foreign languages advantageous. Age approximately 30 to 35. Salary according to qualifications and experience.—Box No. 1467, Electrical Times. (R 60)

ELECTRICAL Contractors require competent OFFICE ASSISTANT for finalising account work. Knowledge of L.C.C. contracts preferred but not essential. Applications to be made in writing; these will be treated in strict confidence.—Evans and Shea Ltd., 12 Essex Road, Romford, Essex. (R 59)

ELECTRICAL DRAUGHTSMAN with some knowledge of motor starting resistance design preferred, but not essential. Age between 22 and 30 years.—Write, stating experience and salary required to E. A. and J. Y. Walsh Ltd., Barton Road Works, Worsley, Manchester. (P 750)

ELECTRICAL ENGINEER required with some knowledge of switchgear or resistance manufacture. Applicants should be between the ages of 22 and 30 years. —Write, in first instance, stating experience and salary required, to E. A. and J. Y. Walsh Ltd., Barton Road Works, Worsley, Manchester. (P 749)

ELECTRICAL ENGINEERING TECHNICAL ASSISTANTS are required for power supply and distribution. Applicants should not be more than 30 years of age and should have received a good general education. Applicants should also have a sound technical training and should preferably possess the Higher National Certificate in Electrical Engineering or equivalent. Practical engineering workshop training will be an advantage. Successful applicants will be engaged on a temporary basis in the first instance. Commencing salary £296 to £549 10s. per annum according to age and qualifications.—Applications in writing to Mechanical and Electrical Engineer, British Railways, Southern Region, 15 St. Thomas's Street, London Bridge, S.E.1. (R 79)

ENGLISH ELECTRIC CO., LTD., Liverpool Works. Applications are invited from MECHANICAL AND ELECTRICAL ENGINEERS with a physics or engineering degree, or H.N.C., who have served an apprenticeship, or had at least three years practical experience in an engineering works engaged in the production of small or medium sized electrical or mechanical equipment. There are several vacancies to be filled in an engineering department responsible for the design, development and technical manufacturing control of refrigerator cabinets, units and all allied equipment such as compressors, evaporators, condensers, motors, thermostatic controls, etc. Experience in any branch of refrigerator production and/or design an advantage, but not essential.—Write, in the first instance, giving a complete history of technical and practical background, and brief details of the particular field in which the applicant is most interested. All applications will be treated in absolute confidence. Starting salaries will depend on experience. The appointments will become pensionable after a qualifying period. Assistance will be given to successful applicants to secure accommodation. Applications, quoting Ref. 731, should be addressed to Central Personnel Services, English Electric Co., Ltd., 24-30 Gillingham Street, London S.W.1. (R 87)

COMBUSTION ENGINEERS

COURTAULDS LIMITED require Assistant Combustion Engineers for their Engineering Headquarters, Coventry. Sound knowledge of combustion technology essential, also previous experience in the operation and testing of both watertube and Lancashire boilers and in dealing with problems in the firing of solid, liquid and/or gaseous fuels. Candidates should be prepared to travel to various factories in the U.K.—Please write for a detailed form of application (quoting the reference number B.6), to the:— **Personnel Department, COURTAULDS LIMITED, 16 St. Martin's-le-Grand, London E.C.1.** (R 16p)

THE appointment of **CHIEF ACCOUNTANT** and **COMPANY SECRETARY** is vacant in a large independently owned Departmental Store. Commencing remuneration £1,750 per annum.

The appointment is an important one requiring experience and ability and applications therefore are only invited from those, of 40 years of age and under, holding the rank equivalent to that of Deputy Borough Treasurer or Chief Assistant in Local Government Service. For fuller details and for an application form write, not later than February 29, 1952, to **MANAGING DIRECTOR, JAMES BEATTIE Ltd, Victoria Street, Wolverhampton.** (R 53p)

ELECTRICAL INSPECTOR required by Firm of Consulting Engineers, Warrington Area; to supervise and report on work in progress on various electrical projects for Air Ministry, universities, hospitals, factories. Good salary offered to man with right experience.—Box No. 1473, Electrical Times. (R 80)

ENERGETIC AGENT required with first-class electrical connection not at present handling electrical accessories for London Postal Area. All sales handled through approved wholesalers so application from wholesalers cannot be considered.—The Kersons Manufacturing Co., Ltd., Hansons Bridge Road, Birmingham 24. (R 88)

ELECTRICAL ENGINEERS required for design work on aircraft electrical systems.—Apply: Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge, Surrey. (R 102)

GRADUATE ELECTRICAL and/or MECHANICAL ENGINEERS required by large firm in the Midlands engaged in heavy electrical and mechanical engineering. Two or three openings for training in Production Engineering and Works Management. Age range 25 to 30 years. Good salary, prospects and facilities for advanced technical education. Excellent conditions.—Please apply in confidence to Box No. 1441, Electrical Times. (R 8)

JUNIOR DRAUGHTSMAN required for detail and production drawings of fluorescent and tungsten lighting fittings. Experience in this class of work an advantage but not necessary.—Apply in writing, stating age, experience and salary required to Personnel Manager, Ekco-Ensign Electric Ltd., 45 Essex Street, W.C.2. (R 78)

JUNIOR METER TESTER required, experience in single phase meter testing essential, phosphase meter experience an advantage. Progressive post for young man anxious to improve. Permanent position, good working conditions, canteen, medical and dental facilities. Non-contributory life insurance and pension schemes, eligibility according to rules. Hostel accommodation available.—Apply, quoting 1/2/1, Personnel Superintendent, English Electric Co., Ltd., Stafford. (R 32)

JUNIOR TEST ENGINEER for high voltage testing work. Age 20-25 years. Technical education to at least Ordinary National Certificate standard. Previous electrical testing experience necessary.—Write for interview, giving training and experience, to The Assistant Secretary, The Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, E.17. (R 76)

LEADING MANUFACTURER of high voltage apparatus in South East Lancashire requires YOUNG ELECTRICAL ENGINEER for research and investigations on insulation. Candidates should be of H.N.C. or Degree standard.—Applications, marked "I," should give full particulars of experience, qualifications and age to Box No. 1439, Electrical Times. (R 7)

LIGHTING ENGINEER required for London Office of Thorn Electrical Industries, Ltd. Experience in preparing industrial and commercial schemes essential. Excellent prospects.—Apply in confidence to Dr. H. H. Ballin, Thorn Electrical Industries, Ltd., 105 Judd Street, W.C.1. (R 69)

LIGHTING ENGINEER required. Full technical knowledge essential and must be accustomed to preparation of fluorescent lighting schemes. Excellent prospects. London district. Own staff know of this advertisement. Replies treated in strict confidence.—Box No. 1475, Electrical Times. (R 89)

LIGHTING REPRESENTATIVE required with sales ability and sufficient technical knowledge to enable him to stimulate interest in large fluorescent installations and discuss technical aspects with lighting consultants, architects, etc. London area. Own staff know of this advertisement.—Write, giving full particulars in confidence, to Box No. 1477, Electrical Times. (R 90)

MALES required as TESTERS on Electrical Measuring Instruments. Good opportunities for young men with required electrical qualifications. Enfield district.—Write full details, age, etc., Box 9951, Frost-Smith Advg., 64 Finsbury Pavement, E.C.2. (R 68)

METER TESTER required for single-phase house service meters. Applicants must have had previous experience of this class of work.—Apply, giving details of industrial experience, stating age, whether married or single, and salary required, to Personnel Officer, Crompton Parkinson Ltd., Chelmsford, Essex. (R 94)

PROFESSIONAL ENGINEERS IN GOVERNMENT DEPARTMENTS. The Civil Service Commissioners announce an OPEN COMPETITION, to be held during 1951-52, for permanent appointments in many departments of the Civil Service for a wide variety of engineering duties. Applications will be accepted at any time but not later than March 31, 1952, and selected candidates will be interviewed as soon as possible after the receipt of their application forms. Candidates are advised to apply as early as possible.

Age limits: candidates must be under 35 on November 30, 1951, with extension for regular service in H.M. Forces and for established Civil Service. For appointments in the Post Office they must be 21 or over, in the Ministry of Supply, 23, and in all other departments 25 or over on that date.

Minimum qualifications vary for different posts. Generally a University degree in engineering or corporate membership of the Institutions of Mechanical Engineers, Electrical Engineers or Civil Engineers, or passes in or exemption from Sections A and B of the corresponding associate membership examinations, or evidence of exceptionally high professional attainment are required. For certain posts, corporate membership of the Institute of Fuel by examination or the Institution of Chemical Engineers, or graduate membership of the Institution of Chemical Engineers, or associate fellowship of the Royal Aeronautical Society or an honours degree in physics, will be accepted instead.

The salary on appointment will be fixed according to age up to 34. The salary for men aged 25 in London is £575, rising by annual increments of £25 to £750, and by £30 to £900. Salaries for women and for posts outside London are lower. There are prospects of promotion to higher grades on scales for men in London of £900-£1,200, £1,250-£1,450, and above.

Further particulars and application forms from Secretary, Civil Service Commission, Trinidad House, Old Burlington Street, London W.1, quoting No. S85/51. (R 91)

QUALIFIED SENIOR LABORATORY ASSISTANT for non-routine testing and development work with a wide range of Domestic Electric Appliances and fittings. Must be conversant with engineering specifications and regulations. Technical training to H.N.C. standard Dudley area. Excellent opportunity for progressive worker.—Full details of age, experience and salary required to Box No. 1471, Electrical Times. (R 77)

REQUIRED by well-known firm of electric cable makers, EXPERIENCED REPRESENTATIVE for London area. —Write, stating qualifications, experience, age and salary required, to Box No. 1479, Electrical Times. (R 103)

RESEARCH ENGINEER required by Cooke and Ferguson Ltd., Manchester, for interesting and responsible work. Applicants should be 23 to 30 years of age and of H.N.C. or degree standard. Experience of materials testing and processing, or thermal and di-electric phenomena, particularly relating to switchgear, will be an advantage. —Please reply, stating full information and salary required, to Personnel Manager, Cooke and Ferguson Ltd., Openshaw, Manchester 11. (R 93)

SENIOR CONTRACTS DRAUGHTSMAN with Higher National Certificate in Electrical Engineering required by switchgear manufacturers in the Manchester district. Able to work with the minimum of supervision on all types of switchboards up to 11 kV. Excellent opportunity for the right man. Salary commensurate with ability. Pension scheme available.—Reply, giving full details of experience, technical qualifications and age, to Box No. 1465, Electrical Times. (R 57)

SINGAPORE. Merchant Company require as Commercial Assistant, an ELECTRICAL ENGINEER with experience in the X-ray field. Bachelor, age about 24. Salary according to experience plus cost-of-living allowance, free furnished accommodation, provident fund, pension scheme, etc.—Apply, Staff Secretary, The Borneo Co. Ltd., 143/149 Fenchurch Street, E.C.3. (R 54)

SURVEYOR required for electrical contractor, able to deal with interim application and agree final accounts, and with a good knowledge of pricing.—Apply: Wm. Townson and Sons, Ltd., Higher Swan Lane, Bolton. (R 92)

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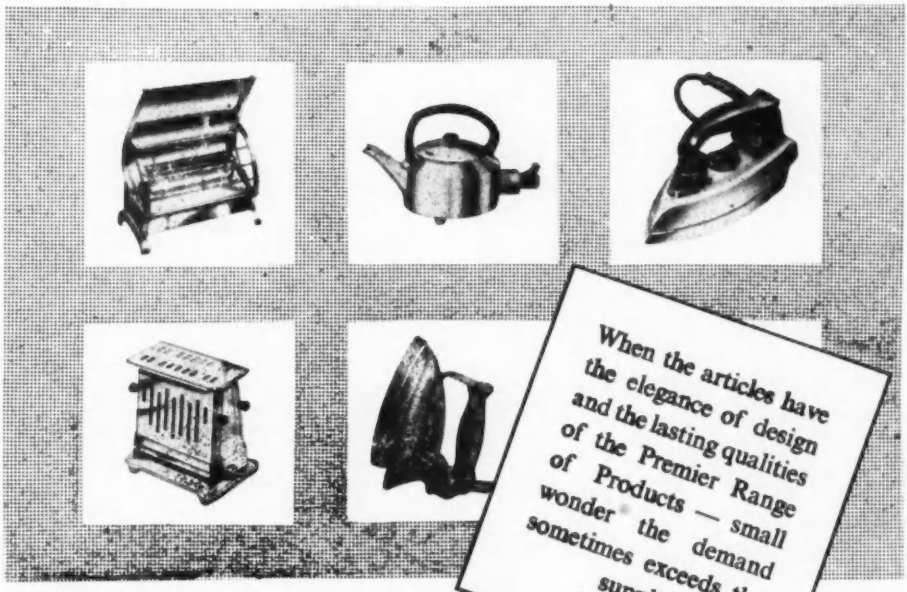

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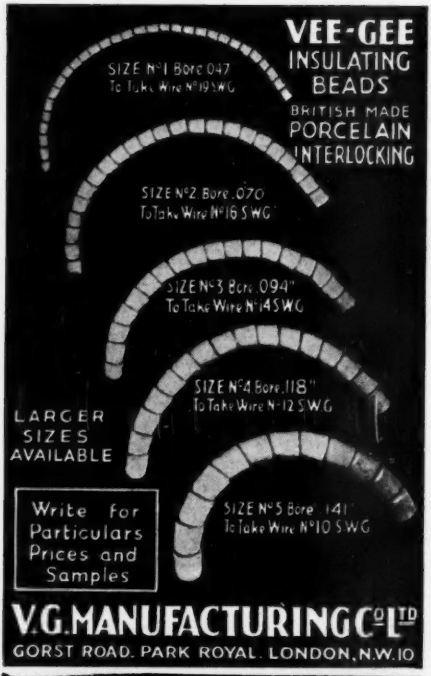

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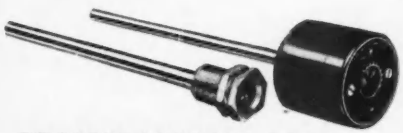

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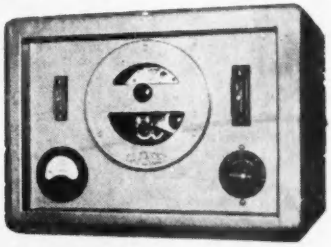

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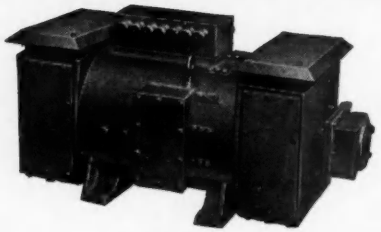

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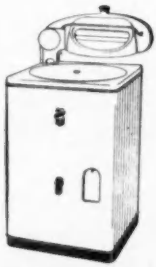

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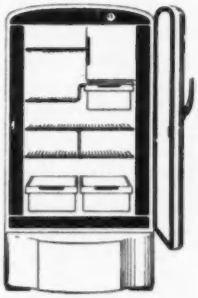

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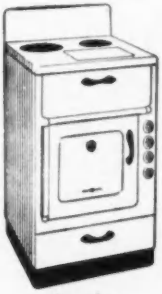

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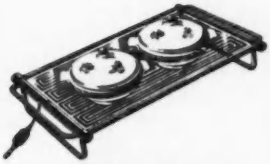

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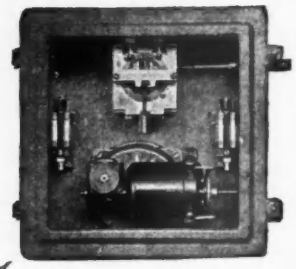

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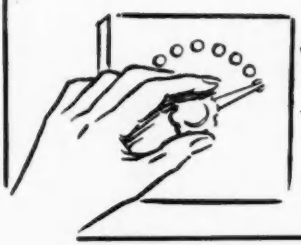

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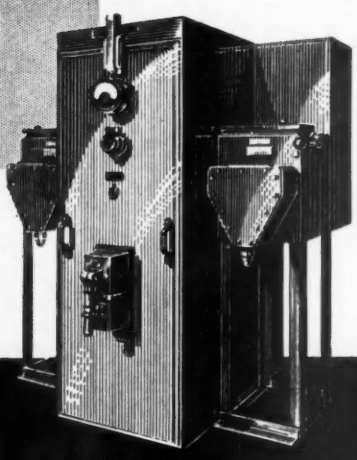

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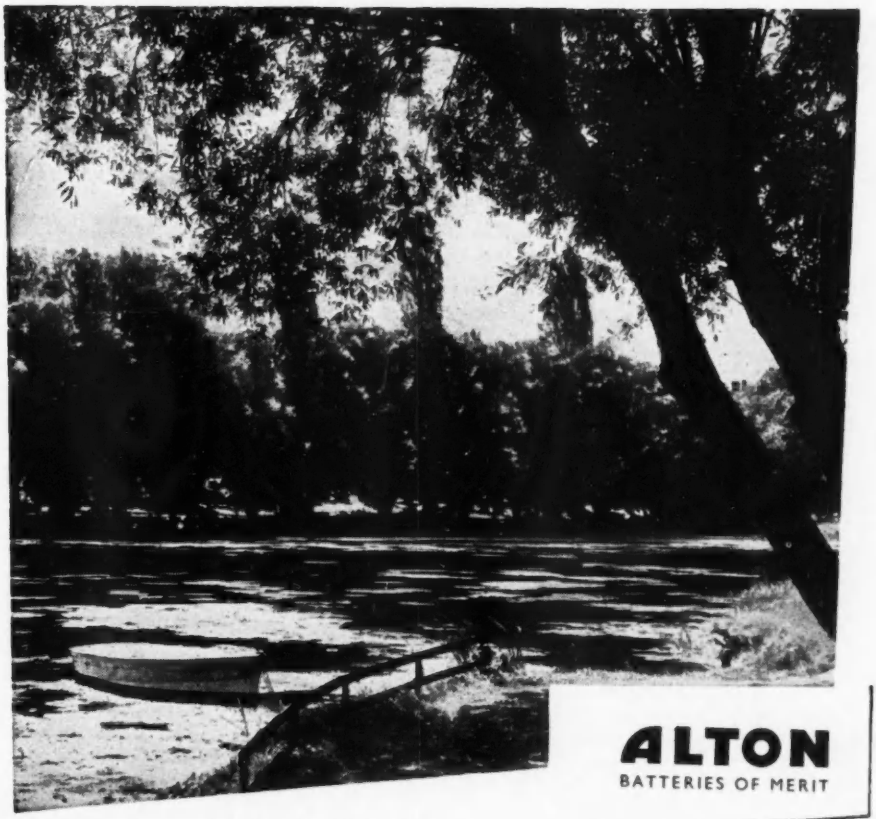

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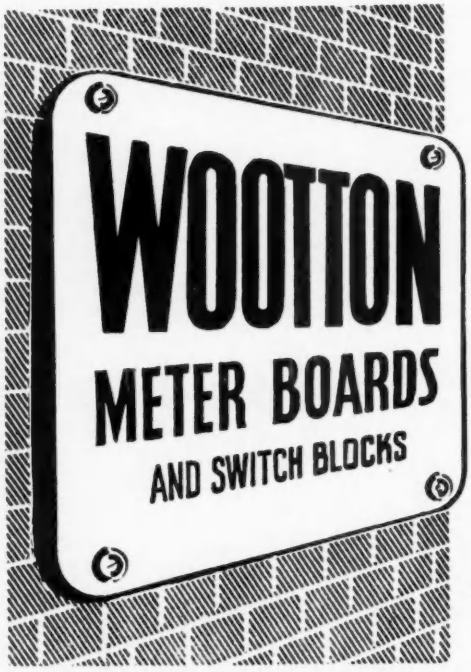

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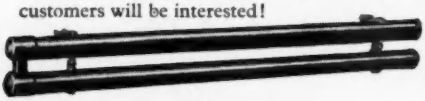

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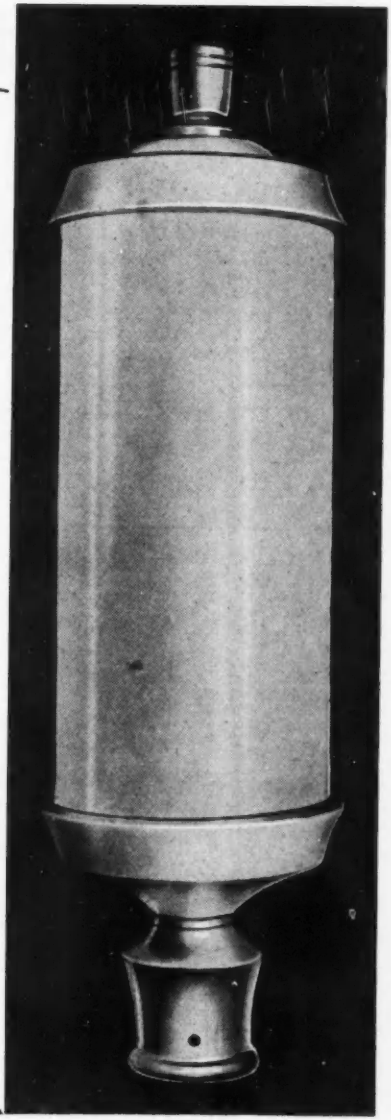
4/40 POST-TOP DECORATIVE LANTERN FOR STREET LIGHTING



The G.E.C. Post-top Decorative lantern has been designed for use with OSRAM 2 ft. fluorescent lamps and is intended for side road lighting. It is also ideally suited for the illumination of promenades, public gardens, balustrades, forecourts, etc.

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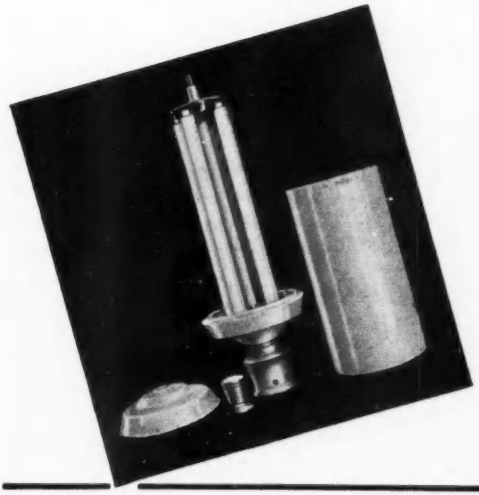

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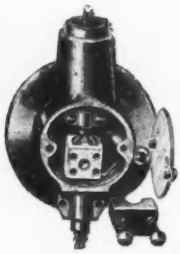

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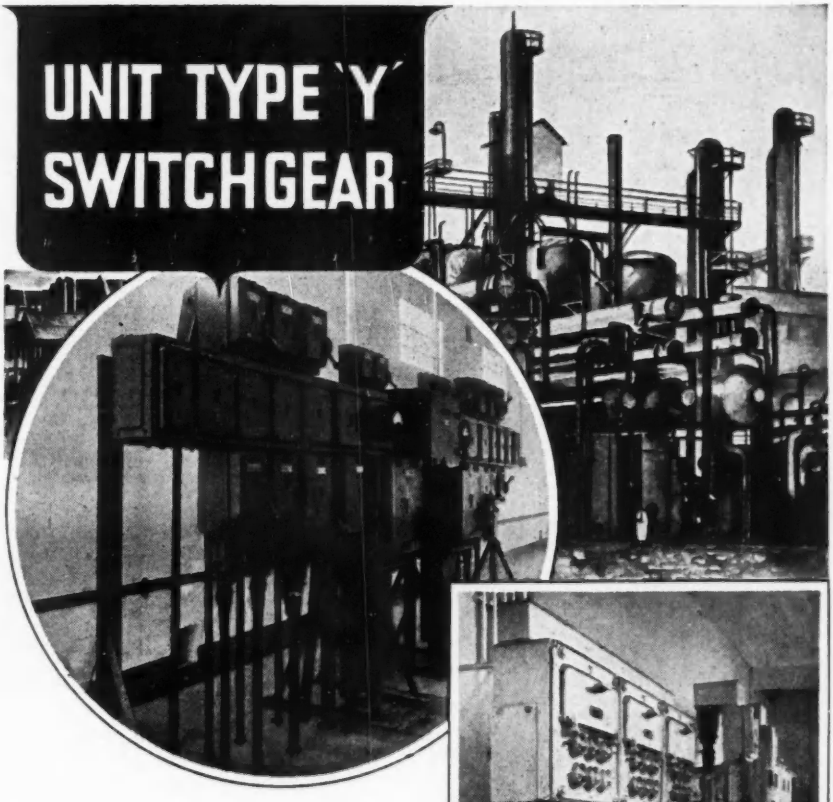

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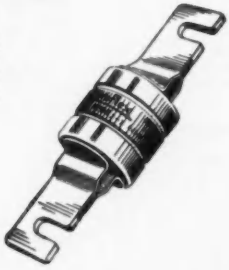

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